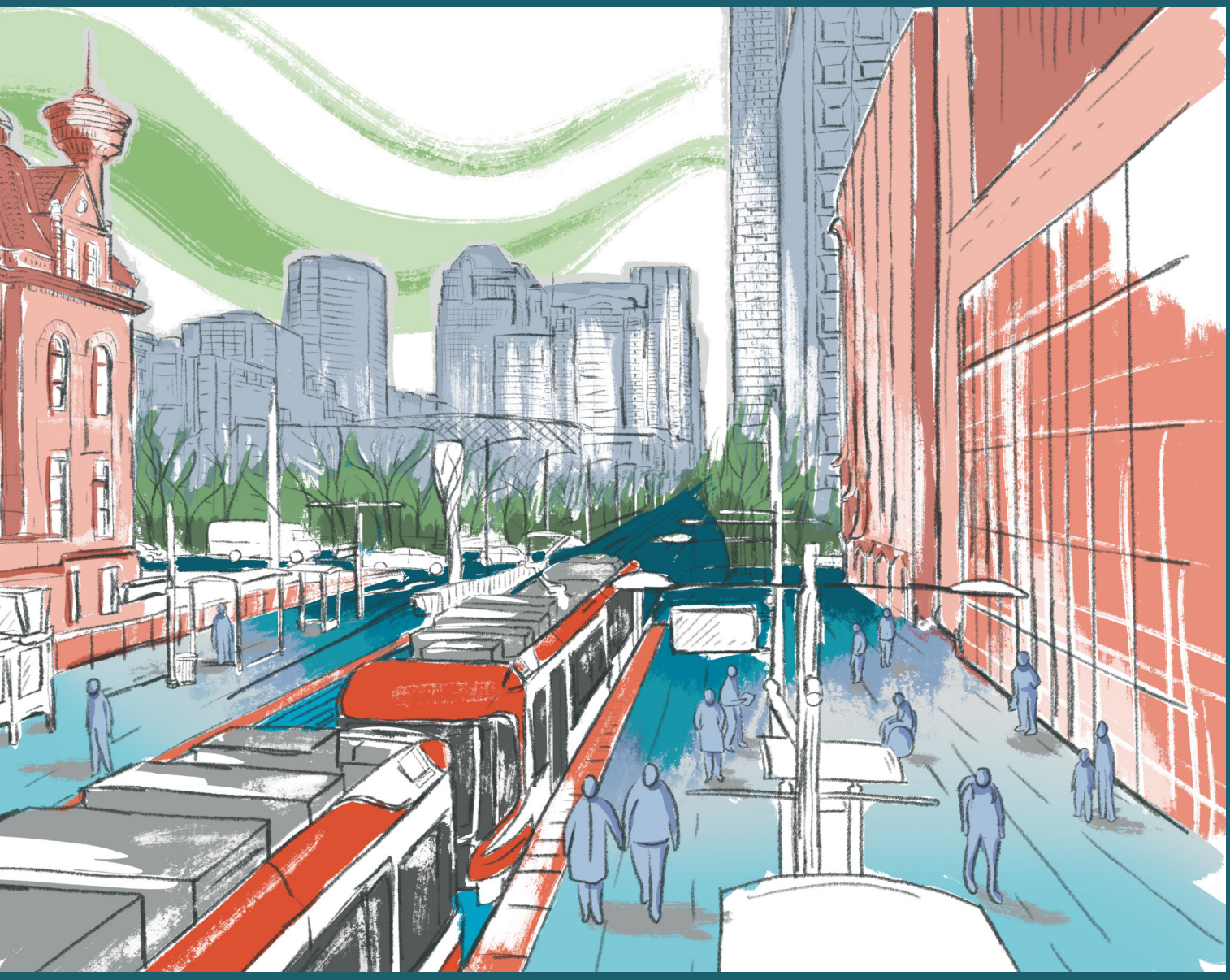
IP2023-0368
Attachment 2

CITY OF CALGARY

ASSESSING A CLOSED SYSTEM AS A PART OF THE TRANSIT SAFETY STRATEGY

MAY 2023



Project Team

The project team thanks City staff and partners for their contributions and guidance throughout this study.

Lead Consultant: Leading Mobility

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- GEC Architecture
- Hanscomb Limited
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EXECUTIVE SUMMARY

Public transit has the primary goal of connecting people to opportunities and services, being immune to the common obstacles that other transportation modes create, like high upfront costs (e.g. purchase of a personal vehicle and insurance), skills (e.g. possession of a driver's license) or ability (e.g. physical fitness to use active modes of transport).

As a result, a successful transit system enhances connectivity, improves the environment, and promotes the economic development of the region it serves. On the other hand, being an integral part of the urban realm makes public transit vulnerable to broader societal trends that impact every aspect of urban life, like the state of public health (including psychological well-being), substance use, and housing affordability.

The major findings of this report are as follows:

- There is no correlation between the provision of fare gates and increased transit safety on existing systems with fare gates. Other transit agencies with fare gates experienced increased safety-related incidents throughout the pandemic and increased complexity with intersecting societal considerations impacting public transit.
- A fully closed system is not feasible within the scope of this study, primarily due to the urban integration challenges and operational issues present at 7th Avenue and Victoria Park / Stampede stations.
- A partially closed system, while technically feasible, is not recommended as it will require substantial modifications to most existing stations; poses significant technical risks and is universally not supported by City business units, partner agencies, community service providers and engaged City partners.
- The City of Calgary could explore an enhanced staff model and associated infrastructure, as specified in Option 3, for inclusion in the City's multi-disciplinary transit safety strategy, which will be presented to Council later this year.

Based on the findings, the report advises against implementing a fully or partially closed access typology on the Calgary LRT system. Based on the technical assessment and partner engagement, focusing on an enhanced staff model and associated infrastructure is advisable to improve transit safety across the LRT system. This approach avoids the substantial risks and challenges related to closed system typologies and provides the most flexibility in resource management and staff deployment in responding to changing conditions on the LRT system.

INTRODUCTION

In May 2022, administration provided the Calgary Transit Recovery Strategy to Council's Community Development Committee detailing a suite of service, safety, and customer experience investments to restore transit service and regain ridership.

The Recovery Strategy Administration informed Council that Calgary Transit will retain a third-party consultant to investigate the feasibility of implementing a closed system, highlighting impacts on customer experience, accessibility, and neighbouring communities.

This report seeks to provide City Council with information and a technical assessment to answer the feasibility questions about fare gates in a fully or partially closed access typology and discuss the opportunities and impacts of an enhanced staff model without fare gates on the LRT system.

This report takes a multi-pronged approach to understand the impacts, opportunities, benefits, and trade-offs in potentially changing station access and implementing fare gate infrastructure on the LRT system.

Each typology (fully closed, partially closed, and enhanced staff) was assessed against six project objectives as identified below:

Safety

Increase safety on the LRT system

Cost

Efficient use of capital and operating funding

Integration

Maintaining access between the LRT station and the local environment

Operations

Ability to serve operational needs and into the future

Equity

Ensuring LRT trains and stations are accessible for all

Experience

Enhancing the customer journey

Recognizing that changes to LRT station access will have significant impacts, the study undertook a two-stage engagement process to understand the implications and benefits of fare gates on internal divisions within Calgary Transit, City business units, emergency services, City partners, and community service agencies. The project also asked questions about each group's perception of transit safety.

In the first stage of engagement, each group was interviewed individually to allow for a focused discussion on their insights and perspectives on changes to station access, fare gates, and transit safety.

In the second stage of engagement, all groups participated in a mobile workshop and site visit of five LRT stations and were allowed to share their perspectives amongst the broader group. Engagement insights were integrated into the access typology assessment by objective detailed later in this report.

This report also speaks to transit safety trends experienced in Calgary and other transit agencies across North America. With transit systems being one of the few public spaces that remained open during the pandemic, the intersection of several complex societal considerations, particularly substance use, mental health, and the unhoused, have changed the safety, security, and outreach approaches in Calgary and beyond. Current and planned program approaches for transit safety in Calgary are documented and discussed in this report.

METHODOLOGY

Summary of Study Approach

A project steering committee oversaw the study made up of representatives from various City business units and guided by a set of project objectives developed collaboratively with the committee. An environmental scan of other North American cities was conducted to identify best practices and lessons learned, which informed the development of three access typologies: fully closed, partially closed, and enhanced staff without fare gates.

The steering committee provided feedback on the typologies, with additional input from the Calgary Police Service, and station groupings were developed to address unique contextual and infrastructural challenges posed by different stations. The station groupings were based on factors such as existing design approach, initial construction era, interactions with neighbouring properties or communities, and access considerations.

Engineering and risk considerations were essential in assessing each station typology to ensure feasibility and partner engagement was crucial to ensure a comprehensive assessment process.

Partners included City business units, community service providers, emergency services and partner agencies who provided perspectives on the potential impact of the three assessed access typologies on their operations.

Three fare technology vendors operating smart card/ticketing and fare gate infrastructure were engaged in this study. The lead consultant also accompanied the Calgary Police Service, Transit Peace Officers, and the Downtown Outreach Addictions Partnership Team (DOAP) Transit/Community Outreach Transit Team into the field to gain insights from front-line staff's perspective on transit safety.

Steering Committee

City staff assembled a project steering committee with representation from Calgary Transit, Emergency Management & Community Safety, and representatives from various business units in Planning and Development Services to oversee and provide direction on this study.

KEY DETERMINANTS OF TRANSIT SAFETY

Public transit has the primary goal of connecting people to opportunities and services, being immune to the common obstacles that other transportation modes create, like high upfront costs (e.g. purchase of a personal vehicle and insurance), skills (e.g. possession of a driver's license) or ability (e.g. physical fitness to use active modes of transport). As a result, a successful transit system enhances connectivity, improves the environment, and promotes the economic development of the region it serves. Being an integral part of the urban realm makes public transit vulnerable to broader societal trends that impact every aspect of urban life, like the state of public health (including psychological well-being), substance use, poverty, and housing affordability.

Negative trends in each of these domains affect the safety and comfort of transit use; however, they are usually beyond the transit agencies' control. This makes any effort to address these challenges only on the transit system rather complex. This section discusses how challenges created by housing affordability, substance use, and mental health affect transit agencies, including Calgary Transit.

As with other societal developments, these trends were exacerbated by the COVID-19 pandemic, as seen with more frequent offenses against transit customers and employees, incidents of overdoses, and a general drop in customer satisfaction on several transit systems across Canada.

Although there is no proof that individuals who are unhoused or have complex needs cause more safety issues on transit, their growing presence on the system has impacted passengers' perceptions of safety and the general cleanliness of the transit experience.

Transit agencies, including Calgary Transit, embraced collaborations with other community service agencies, such as growing the DOAP Transit/Community Outreach Team (COT), to address increased societal complexities on transit systems as a front-line response.

However, these programs don't fully address homelessness, mental health and the opioid crisis, as they require support from other partners, such as the Provincial Government.

Individuals who are unhoused

Individuals who are unhoused use public transit not only as a means of transportation but also as a source of shelter. According to the 2022 Point-in-Time Count, there were 2,782 unhoused individuals in Calgary, of whom only 71% were sheltered at emergency shelters, transitional housing, and other publicly supported sites. While being unhoused is frequently the most evident issue, it is often just one of several challenges an individual encounters, as substance use and unresolved mental health concerns may accompany it. Left with no other places to be, people who are unhoused are pushed by the harsh weather conditions to seek shelter in the public realm, like transit stations and vehicles, libraries, or other facilities that are open to the public.

However, there might be other reasons for an unhoused individual to come to transit infrastructure than a search for shelter. A survey of 108 unhoused individuals conducted at Calgary LRT stations during the Winter 2021-2022 season revealed that they were there mainly to socialize and connect with friends, followed by familiarity with the space, and search for warm shelter, particularly due to Calgary's cold weather climate. The utilization of transit infrastructure by unhoused individuals can consequently lead to a sense of discomfort and perceived lack of safety among transit users. This feeling may be heightened in transit vehicles, where the confined space and proximity to others further intensify the issue.

Rising housing costs and economic instability are prominent factors contributing to those who are unhoused. This is particularly true in Alberta, where financial assistance does not keep up with inflation, and the provincial government exerts only limited support to housing programs.

During the COVID-19 pandemic, housing affordability and the cost of living became more prominent issues in Alberta compared to other provinces. Unlike in British Columbia, where those receiving Canada Emergency Response Benefits (CERB) could continue receiving provincial assistance, or in Ontario, where at least some provincial assistance could be kept, low-income households in Alberta receiving CERB could no longer qualify for provincial financial support.

Overall, the confluence of the factors discussed above has led to an increase to those who are unhoused during the pandemic, putting additional stress on transit systems across Canada. The Toronto Transit Commission (TTC) is one of many agencies that reported an increase in people who are unhoused and have noticeable signs of mental health or substance use issues in stations and onboard vehicles systemwide.

To address that, TTC has collaborated with the Shelter Support and Housing Administration Division of the City of Toronto to offer outreach assistance to people who are unhoused seeking shelter on TTC premises. This collaboration involved 20 Streets to Homes outreach workers, who partner with TTC Special Constables to engage with houseless individuals and refer them to safe indoor shelter locations, perform check on welfare, provide supplies for harm reduction, and assist individuals in obtaining identification documents and income support. Similar community-based initiatives deployed on transit systems are underway in many other places in North America, including Edmonton, Los Angeles, New York City, Philadelphia, San Francisco and Washington D.C.

Mental Health

The mental health crisis affects individuals of all ages and backgrounds and thus is visible in every domain of public life, including public transportation. According to the Canadian Mental Health Association (CMHA), one in five Canadians will experience a mental health issue in their lifetime, and an estimated 11% of the population will experience a mental illness each year.

The stress and uncertainty caused by the COVID-19 pandemic, combined with social isolation and financial strain, have taken a toll on the mental well-being of Canadians. While the coping mechanisms of the general population internalize the stress and anxiety that result from these challenges, psychologically vulnerable individuals may have more expressive reactions. Such instances of mental health crises are more aggravating on transit due to the limited space, enclosed environment, and inability to leave at any moment by the users who witness or experience the frustration of other individuals.

Transit agencies experienced the direct effect of the psychological toll of the COVID-19 pandemic, as numerous workers left the sector due to emotional burnout from dealing with safety protocols enforcement and with equally stressed riders. Available data speaks directly to the fact that mental health became a more prominent challenge for transit systems during the pandemic.

For example, between 2018 and 2022, Metro Vancouver Transit Police reported a 34% increase in Section 28 Mental Health Apprehensions (e.g. due to a person's actions that could have endangered that person's own safety or the safety of others and/or their apparent mental disorder).

Metro Vancouver Transit Police has established a specialized unit called the Community Engagement Team, which includes six Neighborhood Police Officers assigned to specific community service regions, an Indigenous Liaison Officer, and a Client Services Officer.

This team collectively offers support to community members facing mental health challenges. Additionally, the unit plays a significant role in executing the Transit Police Mental Health Strategy and the recently introduced Homeless Outreach Strategy. In Calgary, a 12-month mobile crisis response unit pilot is presently underway provided by the Alex Community Health Centre where each mobile crisis team will have two support workers trained in mental health and addiction distress, who will respond to non-emergency 911 calls and the 211 distress centre. This pilot is operational in Calgary Police Service – District 4.

Numerous strategies can be identified from the actions taken by transit agencies in response to the increasing mental health challenges.

The first focuses on the additional training of transit employees in assisting people experiencing mental health issues. For example, the TTC is currently receiving assistance from the City of Toronto to provide de-escalation training to all its chief and mobile supervisors. This training will assist supervisors in supporting station staff and transit operators if such a need emerges. Similar de-escalation training is being provided to front-line staff on Vancouver's SkyTrain system.

The second approach involves partnering with organizations that can offer specialized support to individuals encountering mental health emergencies, like Toronto Community Crisis Service/211.

Further, dedicated marketing campaigns have been developed and posted in TTC transit stations to inform riders about the services within the local area that can help them improve their mental well-being.

Lastly, it should be acknowledged that very little is known about the challenges that individuals with mental health issues face on public transit.

While there are some good practices that agencies have implemented, there is a significant deficiency of information, and more research needs to be done to understand and address these gaps.

Substance Use

Substance use is a growing societal concern, often resulting from other challenges an individual might face, including being unhoused, poverty, social inequality, or mistreated medical conditions. Moreover, in the case of housing, it is a bi-directional relationship, as people who spent more time on the streets were found to have a higher rate of substance use.

Unsurprisingly, research has found that freezing temperatures tend to push persons who use drugs to do so indoors, which results in choosing transit facilities as temporary consumption sites for those lacking other options. In Calgary, there is only one supervised consumption site located at the Sheldon Chumir Health Centre, where attendees must provide an Alberta Health Care card and cannot consume substances by smoking. Recent data from the City of Calgary has documented a significant increase in check-in welfare occurrences related to substance use on the LRT system during colder winter months.

Naturally, the growth of the unhoused population and the increase in the number of people facing mental health issues observed during the COVID-19 pandemic also impacted the uptake of substance use.

Moreover, border and travel restrictions interrupted the flow of unregulated drug supply and caused the emergence of mixed substances that, together with fewer harm reduction initiatives during the pandemic, contributed to the increase in overdose (OD) instances. Congruent with this increase, more ODs observed on public transit have contributed to the decline in the feeling of safety of many transit users. The increased presence of drug related paraphernalia discarded at transit stations is also contributing to the decline of the perception of safety on public transit.

Overall, there is no doubt that the COVID-19 pandemic has only facilitated the negative trends in housing affordability, mental health, and substance use disorder. Moreover, economic hardships, isolation, and fear of illness have contributed to increased stress, anxiety, and depression among commuters and transit workers. Dealing with these issues requires comprehensive and sustained interagency efforts to improve access to services and supports for those in need.

While transit agencies can partner in such efforts, they possess no instruments or means to tackle those issues independently. Nevertheless, transit agencies attempt to address the immediate symptoms of those challenges. Examples of such responses include the additional presence of front-line staff to ensure customer support and assurance, deployment of dedicated staff trained in assisting people in distress and able to connect those in need with housing or medical services, expanded cleaning efforts, staff training, and public education campaigns.

While there is a difference in the prevailing philosophy that agencies take, some leaning more towards enforcement, with the others investing in community approaches, it is obvious that there is no technological, infrastructure or policy silver bullet solution. Many strategies need to be deployed concurrently to increase transit's objective and perceived safety.

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CURRENT SAFETY TRENDS ON CALGARY'S LRT SYSTEM

Safety on public transit encompasses a wide range of issues, including physical safety and public health. Ensuring physical safety on public transit requires the cooperation of transit authorities, law enforcement agencies, and passengers. Transit authorities are responsible for implementing safety measures, such as maintaining equipment and infrastructure, monitoring passenger behaviour, and responding to emergencies. Law enforcement agencies play a critical role in providing security and enforcing the law, while passengers have a responsibility to follow safety rules and report safety concerns.

The COVID-19 pandemic had a significant impact on Calgary LRT system ridership, with passenger boardings only reaching back to pre-pandemic levels in January 2023, as well as safety, as reflected in the increase of disorder experienced on the transit system as captured in the data collected by both Transit Public Safety and the Calgary Police Service. This section uses that information to summarize safety trends on the Calgary LRT system.

LRT System Safety Trends

While examining the safety trends on the Calgary LRT system during the 2018-2022 period, it is easy to notice the challenges that the system faced and an effort to address the issues.

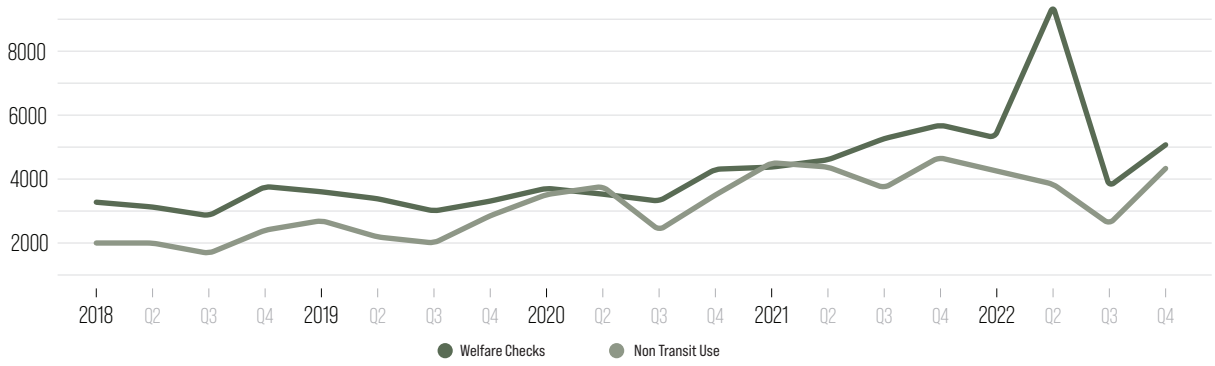

Figure 5.1. 2018-2022 checks on welfare and reported instances of people using transit for non-transit purposes

As noted in Figure 5.1, it becomes clear that annual reports of transit use for non-transit purposes went up by 87% from 2018 to 2022.

Nevertheless, more than 15,000 reports of non-transit use received in 2022 was a 13% decline from the peak observed in 2021. Potentially, that was a result of more frequent checks on welfare that increased by 81% annually between 2018 and 2022.

Reports indicate that the share of fare evaders increased over the last years: from 1.67% in 2019 to 4.94% in 2022; however, the number of fare inspections decreased over the course of the pandemic as Transit Peace Officers focused their efforts on responding to calls for service.

Regarding property crimes (e.g. property damage and graffiti) the 2018-2021 annual average was 660, the most dramatic spike occurred in 2022, reaching a total of 927 occurrences, a 30% growth from the 2018-2021 average. For comparison, property crimes increased by 1.2% in the City of Calgary over the same period.

When discussing property crimes on Calgary LRT, it's important to note that there is an obvious seasonality to these incidents. Between 2018 and 2021, the first quarter typically had the lowest number of property crimes (an average of 93), while the fourth quarter had the highest number for the 2019-2021 period (an average of 271). However, this pattern changed in 2022, with the largest number of property crime reports occurring in the first quarter (414) over the examined period, and the pattern previously observed at the beginning of the year reemerging in the third quarter of 2022.

Opioid overdoses (OD) were observed a similar peak in the first quarter of 2022 noticed earlier in property crimes. With 398 reported ODs, this was a 160% increase from the same period in 2021 and a 580% growth from the average of Q1 2018 - Q1 2021.

In cumulative terms, opioid overdoses display the most dramatic increase among the trends observed.

There were 111 and 95 instances of opioid overdoses in 2018 and 2019, respectively, going up almost three times in 2020 to 301 and more than doubling again in 2021.

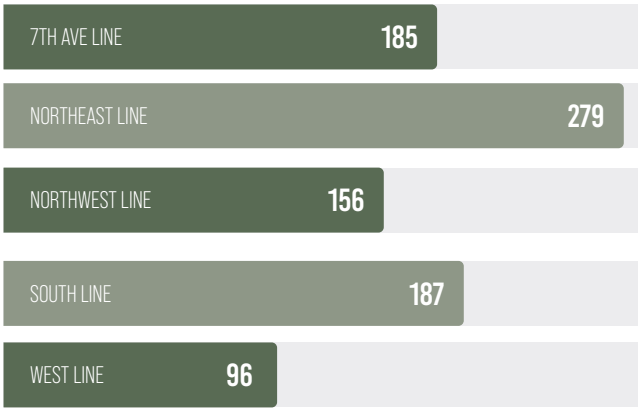

Figure 5.2. 2022 Calgary LRT opioid overdoses by leg (data complied by City of Calgary Transit Public Safety Unit)

There were 914 opioid overdoses reported on Calgary LRT in 2022, which was twice as many as in 2018-2020 combined. The spatial variation in 2022 opioid overdoses is presented in Figure 5.2.

As it shows, about a third of 2022 ODs took place on the Northeast Line. Marlborough and Rundle stations were the two top locations on the whole system (84 and 72 ODs, respectively). Nevertheless, the effort to affect the trend can also be observed. For example, the use of naloxone[1] kits went up from 52 per year in 2018 to 265 in 2022.

1 Naloxone is a rapid-acting drug that temporarily reverses the effects of opioid overdoses

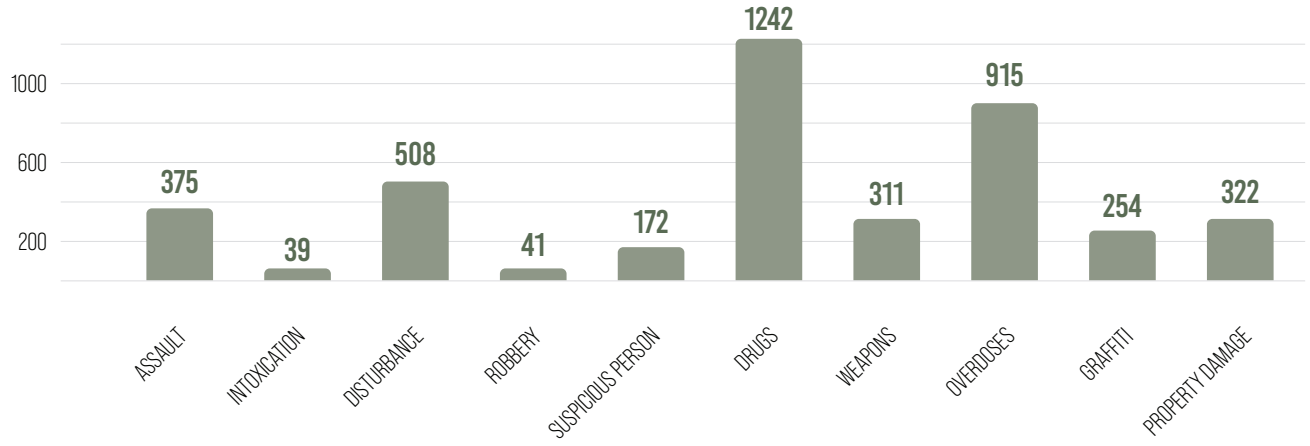

Figure 5.3. 2022 Calgary Transit system-wide disorder reports (data complied by City of Calgary Transit Public Safety Unit)

Overall, when different categories of transit disorder in 2022 are stacked together as in Figure 5.3, it becomes clear that reports of drug-related activities and overdoses were the two top categories reported that year.

Social disorder metrics as reported by Transit Public Safety includes assaults, intoxication, disturbance, robbery, suspicious person, drugs, unwanted persons, checks on welfare, and weapons available for the system by LRT leg are presented in Figure 5.4.

Notably, about half of those occurred on the Northeast and South LRT lines (25% and 26%, respectively) and another 22% on the Northwest Line. The 7th Avenue and West lines accounted for 14.7% and 13%, respectively.

At the same time, similar spatial distribution can be found of the monthly average number of people at the LRT stations at the end of service, as presented in Figure 5.5.

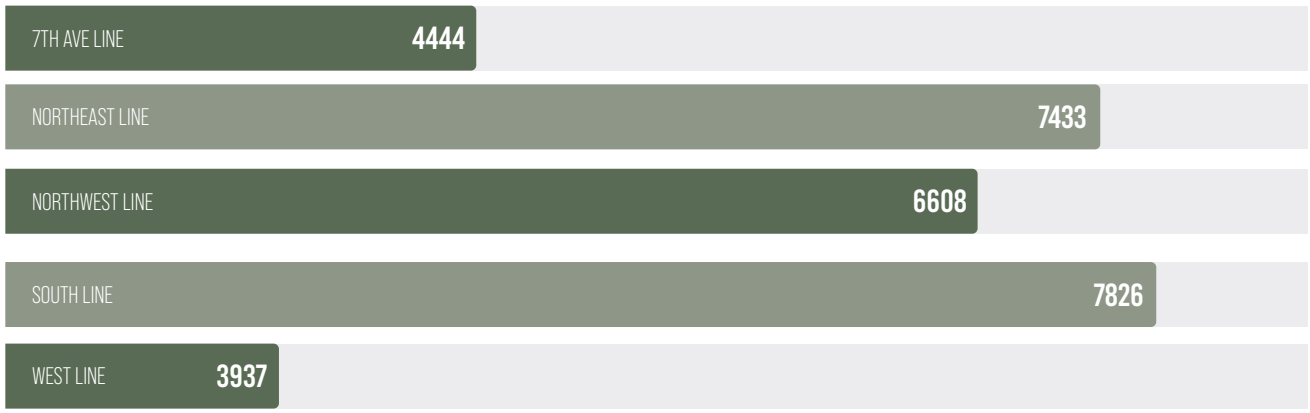

Figure 5.4. 2022 Calgary LRT social disorder reports (including assaults, intoxication, disturbance, robbery, suspicious person, drugs, unwanted person, checks on welfare, and weapons) by lines (30,248 total) (data complied by City of Calgary Transit Public Safety Unit)

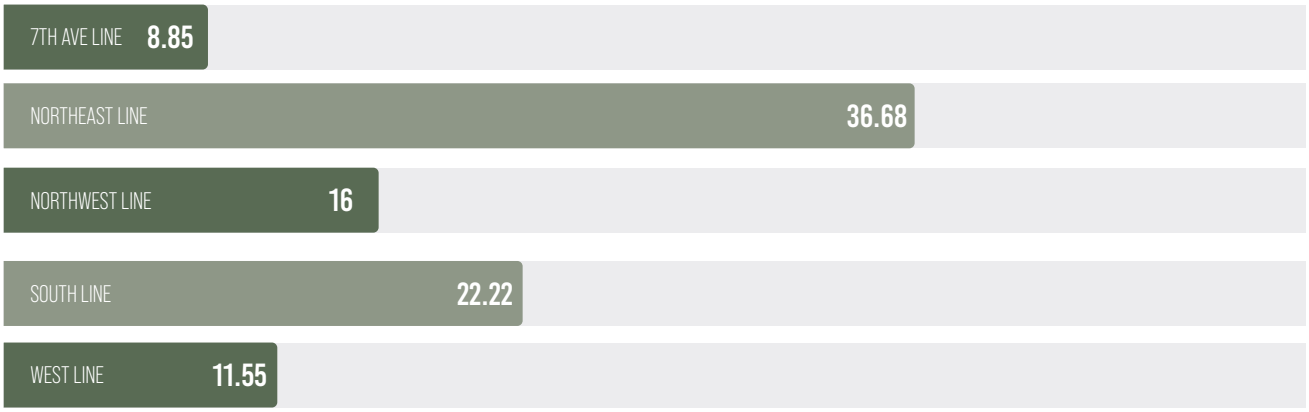

Figure 5.5. 2022 monthly average number of people at the Calgary LRT stations at the end of service by lines (data complied by City of Calgary Transit Public Safety Unit)

These service counts are done at the end of train service, when dispatchers count the number of people on CCTV before Transit Peace Officers patrol and close the station at the end of the service day.

Limitations of Transit Safety Data

Transit safety data discussed in this report has limitations and might not indicate existing trends. When writing this report, data was only available to Q4 of 2022.

More generally, safety-related data on public transit often lacks important context, such as the time of day, exact location, and circumstances of the occurrences. Moreover, violations on public transit typically only include reported occurrences that occurred physically on transit vehicles or in transit stations. It may not capture violations near transit stations or involving transit riders but take place off transit property.

ENVIRONMENTAL SCAN

This section reports on the findings of the environmental scan through the lens of the project objectives for each city - safety, cost, integration, operations, equity and customer experience.

The five selected cities, which include Boston, Edmonton, Los Angeles, Toronto, and Vancouver, offered an opportunity to investigate open, partially closed and fully closed rapid transit systems operating elsewhere in North America with respect to differences in mode transfers, fare policies, technologies, and system maturity. The findings from this environmental scan are presented for each respective city below.

BOSTON

PARTIALLY CLOSED SYSTEM - GREEN LINE

The Massachusetts Bay Transportation Authority (MBTA) operates fare gates at its subway, underground light rail stations, some bus rapid transit stations, and one commuter rail station.

Since 2017, MBTA has been working on a fare transformation project - Automatic Fare Collection (AFC) 2.0 that aims to allow for “tap and board” at any door with a fare card, smartphone, or contactless credit card.

MBTA provides an example of a partially closed system with underground stations on the Green Line LRT within Downtown Boston having fare gate control, while stations on surface segments of the four branches of the Green Line LRT operate with a proof of payment system with fares purchased from the light rail vehicle operator.

Staff in the environmental scan interview documented that fare gates have been operating at rapid transit stations since the system’s inception and their past and future upgrades were undertaken mainly to implement the newest developments in fare collection.

The only exception is the recently introduced fare gates at the North Station on the commuter rail system which were implemented to reduce fare evasion through the cost and revenue-sharing agreement between MBTA and the commuter rail operator Keolis Commuter Services.

Safety

As a legacy fare gate system, MBTA has not performed any formal evaluations of the impacts on the safety of its fare gates. Nevertheless, like many other agencies, MBTA experienced the challenge of ensuring safety for its riders during the COVID-19 pandemic, with instances of violence and overdoses setting records in 2021. The detailed data is not publicly available to be reported as trends; however, MBTA acknowledges the safety of its staff and riders as a priority for the agency.

For example, safety is an integral part of the ongoing fare transformation project since one of the reasons for the envisioned implementation of fare collection at all doors on LRT cars is to remove fare collection responsibility and potential conflicts from operators at the street-level Green Line stops.

On the other hand, looking back at the installation of fare gates at the North Station of commuter rail, MBTA received anecdotal evidence from staff regarding improving the station lobby's perceived safety. They do not explain the improvement by the deployment of the fare gates, but rather the presence of station staff that limit the activities of loiterers and provide customer service to riders.

Cost

The current fare collection system at MBTA, AFC 1.0, cost approximately $32.2 M to operate in 2020, where 48% accounted for labour, maintenance and cash handling took 12% of the budget each, 10% went to the payment card industry compliance, another 8% covered fare media, and 3% accounted for transaction costs.

With more than a billion dollars worth of investment in AFC 2.0, which includes the replacement of the existing system and ten years of operation and maintenance to be provided by the vendor, MBTA expects to improve customer experience and bring down the annual operational cost to approximately $30 M in 2031.

Integration

The MBTA Green Line LRT's partially closed system presents challenges. At underground stations, all doors theoretically open since riders have already paid the fare at the gates. However, only the front door should open at street-level stations, as that is where onboard payment can be accepted. In practice, to prevent crowding and decrease dwell times, all doors should open at specific street-level stations. MBTA intends to install fare collection equipment at all LRT system doors in the future.

MBTA is integrating the card reader technology from the current fare gate manufacturer, Scheidt & Bachmann GmbH, and the AFC 2.0 manufacturer, Cubic Corporation, as part of the fare transformation project. During the transition period, when both old and new cards are in use, a custom-designed interface control board will enable the processing of information from both card readers to open the gates.

Operations

Currently, the fare collection system is operated and maintained internally. However, the new AFC 2.0 system will be handled by the fare technology vendor, which means that around 80 to 100 full-time employees (FTEs) will be required to complete this task. In both the current and future systems, the maintenance staff do not stay at the stations but are located in a central office where maintenance requests are dispatched.

However, in an emergency, on-station staff have a button that allows them to open the fare gate. The same action can also be carried out from the control centre. First responders are given transit passes so that they can enter the stations in the event of an in-station emergency. Additionally, if there is a power outage, the current fare gates will automatically open since they require electricity to remain closed. Electric batteries in the new fare gates will ensure that the doors will be open long enough for the riders to get out, even during a power outage.

Equity

The diversity of backgrounds and abilities is given a high priority in the redesign of the existing fare collection. Even the standard gate will be 29.9" wide, 7" wider than the current gate. In comparison, the accessible gate will be 40.9" wide, 5" wider than the current accessible gate, to ensure a smooth experience for people with different abilities.

All gates will have a second reader for people in wheelchairs to easily tap, while information screens will be at an angle for people of different heights to see. Similarly, specific attention is paid to colour symbols to be visible for riders with visual impairment. MBTA also spent deliberate effort calibrating the design and mechanics of the new gates, placing customers' safety above fare enforcement.

The new gates will have swinging doors, so their size and speed were adjusted to not to cause any harm to a person whom they might hit.

Customer Experience

The MBTA has recently introduced fare gates at the North Station of their commuter rail system, which serves as an example of a possible customer experience conflict.

It was a steep learning curve for commuters, as they had to progress from the visual confirmation of payment by fare enforcement staff to tapping in and out of the station. Nevertheless, MBTA had been prepared for a longer uptake that, in practice, took only a few weeks, as frequent riders quickly developed the muscle memory for the new system. The only riders who still need clarification are one-off customers (e.g. those who take transit to events at nearby sports arenas), which facilitated a continued need for on-site staff to support occasional customers.

EDMONTON

OPEN SYSTEM WITH NO FARE GATES

Edmonton and Calgary share many similarities in providing transit services, including a highly integrated bus and LRT system, as well as facing similar safety related challenges occurring in their respective transit systems.

Currently, the Edmonton Transit Service (ETS) does not operate fare gates on any of the existing LRT lines, and none will be installed at the stations on the new low-floor Valley Line.

Nevertheless, ETS is included in this environmental scan as a case study of the policies deployed in a context similar to Calgary's to address the system's safety challenges. In 2022, ETS staff evaluated fare gates with a specific lens on safety on other transit systems and did not find any evidence or correlation between fare gates and increased levels of customer safety.

Safety

An analysis of available data that can speak to the safety trends on ETS points out the similar challenges that both Calgary and Edmonton face.

There has been more than a twofold increase in emergency service calls that ETS Control Centre initiated, from 926 in 2018 to 2,298 in 2021. Notably, while police interventions accounted for more than half of the total calls in 2018, that share went down to a third in 2021, with medical requests representing the majority of other requests.

In the first seven months of 2022, that ratio remained unchanged, with the total number of calls amounting to 1,680 - a 42% increase compared to a similar period in 2021.

The most significant change can be observed in the requests for checks on welfare which went up by 305% between 2018 and 2021. It is quite likely that the upsurge in requests for emergency medical services and checks on welfare was driven by the overall increase in overdoses North American cities experienced during the pandemic. For example, in Edmonton, 13.7 deaths per 100,000 people were the result of drug poisoning in January 2016, and by January 2022, that increased to 58.4 deaths per 100,000 people.

This trend can also be traced in the Edmonton Police Services reporting. When comparing the criminal occurrences at transit centres and LRT stations with the citywide instances in the first three months of 2023, many of the categories, like violent and disorder occurrences, account for comparable shares of instances.

On the other hand, the disparity is noticeable for the events that required Edmonton Police Service assistance to emergency medical services, as those accounted for 40% of instances on transit facilities and only for 14.5% citywide. The second category with such a pronounced difference was weapons-related occurrences. This category accounted for 6.8% of total occurrences at transit centres and LRT and 2.5% citywide.

Cost

Intending to increase transit safety, the City of Edmonton adopted a Transit Safety Plan in June 2022. The core component of the plan is the pilot project that extends the operations of the Community Outreach Transit Team (COTT) by adding three more peace officers and three outreach workers for 2023-2025.

The program is modeled on a similar effort led by the City of Calgary, with an estimated annual cost of $1.27M. Also, in 2022, $10.2M was allocated to hire more Transit Peace Officers who monitor pedestrian walkways near LRT stations in addition to transit facilities. This funding also enabled the deployment of extra security guards to several transit facilities and LRT stations.

Integration

ETS introduced an electronic fare payment system called the ARC card in November 2022 to supplement the existing paper-based fare collection approach. It is an account-based system that is utilized by ETS and smaller regional transit providers operating in the rest of the metropolitan region. Riders are expected to tap in on entering the proof of payment area at the LRT stations or when boarding a bus and are encouraged to tap out at the end of the trip.

Operations

The Community Outreach Transit Team (COTT) is a partnership between City of Edmonton Transit Peace Officers and Bent Arrow Traditional Healing Society outreach workers. Together they provide a unified response to social challenges that are compassionate, trauma-informed, and centred on the needs of the person.

The COTT has a diverse portfolio of responsibilities, including facilitating access to support, housing, and health services to people who struggle to secure those and promoting compliance with community standards among passengers through engagement, education, and encouragement. If necessary, the COTT is also tasked with enforcement of the rules to ensure the safety of the transit network.

Equity

As a national leader in Gender-Based Analysis Plus (GBA+) efforts, the City also conducted a GBA+ evaluation of the Transit Safety Plan, that recommended continuous investigation of the systemic reasons for the observed safety trends, public education, and awareness, and collaboration with community partners among the other strategies.

With the introduction of the ARC card, ETS decided to take advantage of an account-based smart fare system and will start collecting gender data of its riders to better understand the travel needs of different gender groups and embed that knowledge in future service delivery models.

Customer Experience

Available statistics on the experience of transit riders in Edmonton indicate that since 2015, perceptions of feeling safe overall have fallen slightly from 83% to 78% in 2021.

LOS ANGELES

PARTIALLY CLOSED

The Los Angeles County Metropolitan Transportation Authority (LA Metro) operates a partially closed system with fare gates on the subway and some underground light rail stations.

After a decades-long "honour" fare collection system, the decision to install fare gates was taken in 2007 after a study discovered that about 5% of riders did not pay fares, which cost the agency about $5.5 million annually. Fare gates have been installed for the Red and Purple subway lines and at the underground stations for the Blue and Expo LRT lines in Downtown Los Angeles.

Safety

LA Metro did not initiate the installation of fare gates to improve safety, so no formal evaluation of its effect on safety has been performed.

To gain some insight, though without the intention to claim any causality, this report performed an inspection of publicly available data on criminal activity on different lines of the system. For example, in the first nine months of FY 2022, law enforcement agencies responded to 272 crimes on the Blue and 212 criminal incidents on the Expo LRT lines (where fare gates are in use only at the 7th Street/Metro Center station), as well as 506 incidents on the Red and Purple lines of the subway (two lines share the majority of tracks, with all stations equipped with fare gates).

At the same time, there were 132 and 144 crime reports at the Green and Gold LRT lines respectively, suggesting that during that time, on average, lines with fare gates saw more criminal activity than those without them, which is likely an indication of their higher use (for example, in 2022 the Purple line accounted for 44% of total weekday riders on LA Metro). Moreover, this pattern of criminal activity across different lines is detectable pre-pandemic as well. No discernable trend could be observed in the distribution of types of crimes, namely crimes against persons, against property, and against society. Some of those crimes involved houseless people, though LA Metro does not believe them to be the main driver of criminal activity, while there is an opinion that lack of human presence (e.g. on-station commercial establishments) might be a contributing reason.

Nevertheless, LA Metro should be acknowledged for its efforts to address safety issues systemwide. Recognizing the impossibility of solving the safety challenges using only law enforcement, they hired 40 full-time social workers, while LA County funded another 40 part-time staff for the houselessness outreach effort.

Cost

The initial plan for installing the 387 turnstiles was estimated at $46 M in 2009 dollars, with every additional station upgrade with fare gates amounting to $500,000 per station in 2014. It is likely that fare gates were at least partially successful to capture some of the previously lost payments.

Los Angeles Times compared LA Metro ridership and fare payment data from January 2013 before the fare gates were installed, with the same metrics in April 2014, after the stations were gated, using the difference between the number of payments processed and riders on the system as a proxy for fare evasion. For the Red and Purple subway lines they found the difference between payments and riders to go down from 46% to 13% over that period.

Integration

LA Metro installed fare gates only at underground LRT and subway stations where there is an opportunity to minimize the number of access points to enter and leave the station (e.g. underground station concourses). Like the MBTA Green Line, LRT stations outside of the Downtown core operate with an open system, except that customers are required to purchase tickets and validate fares from ticket vending machines and smart card validators on station platforms before boarding LRT trains.

Operations

Under the contract from LA Metro, Cubic Corporation provides maintenance and support services for the contactless transit payment system TAP. The latest 5.5-year extension of the contract that took place in 2019 amounted to $68.2 M. This contract also included support for the mobile payment application developed the same year.

Equity

All stations with fare gates on the LA Metro system have separate wider ADA-compliant isles. Moreover, since 2020 LA Metro has been piloting and gradually expanding the use of wearable TAP devices - mainly in the form of a wristband and a keychain.

People with mobility challenges are envisioned among the primary audience for wearable TAP devices as they do not require the smart card to be pulled out, which may cause difficulty for some users, when accessing the station through a fare gate.

Customer Experience

Implementation of fare gates began in 2009 with the trials on the Purple Line at the Union and Wilshire-Normandie stations (eight and five turnstiles, respectively). That pilot has gradually expanded to the full extent of the Red and Purple subway lines and underground stations of the Blue and Expo LRT lines.

An overview of the media for the period since the implementation of fare gates by LA Metro did not reveal any major reports on customers' dissatisfaction with the turnstiles. In fact, some riders praised the upgrade and expressed concern that so many stations remained ungated where some patrons chose not to pay for the service.

TORONTO

CLOSED SYSTEM

The Toronto Transit Commission (TTC) operates a highly integrated rapid and surface transit network, where every surface bus and streetcar route connects with the TTC subway system. All TTC subway stations operate as a closed system with smart-card-enabled fare gates (PRESTO) at every station entrance. The presence of TTC staff at these stations also offers insights into the effects of the enhanced staffing model.

Safety

TTC staff interviewed for this report directly pointed out that their agency deals with the same safety concerns as Calgary Transit does, and they do not see fare gates making any difference in addressing transit safety. A variety of gate designs were tried over time, with a gradual evolution from turnstiles to fare gates, however even these do not stop people from getting into the system if they want to.

The TTC has experienced an increase in offenses against customers during the pandemic. In 2022 there were 1,068 offenses against customers, up 46% from the 734 offenses in 2021. Calls for service from the TTC's Special Constable Service on the subway system have increased from 18,849 in 2019, 21,381 in 2020 and 26,817 in 2021.

Cost

The cost of the capital infrastructure for the TTC fare gate program was covered by Metrolinx, a Crown agency of the Government of Ontario that manages and integrates regional public transportation in the Greater Toronto and Hamilton Area. TTC purchased the fare gates with a volume discount (1,000 fare gates) combined with a maintenance program where TTC staff conduct first-line maintenance and the fare gate vendor Scheidt & Bachmann GmbH providing support for more complex maintenance activities.

Integration

At every TTC subway station's primary customer access point, staff are available in a booth to assist customers in purchasing fares, provide customer information, and monitor security cameras within the station.

Also, to allow operators to focus on streetcar operations, the streetcar system has recently transitioned to a proof of payment "open" system with the full deployment of the 204-car low-floor streetcar fleet. Fares must be purchased on board the streetcar at the ticket vending machine. PRESTO card readers have also been installed at every streetcar door.

Operations

The TTC is primarily responsible for operating and carrying out first-line maintenance of the fare gates. Only if the TTC cannot resolve an issue Scheidt & Bachmann GmbH become involved. Scheduled maintenance checkups are conducted on the fare gates every three, six, nine, and twelve months.

To facilitate this maintenance schedule, 40 technicians, three supervisors, and one manager are assigned to the fare gate program. Approximately 90% of this team's work plan is fare gate maintenance, with the other work pertaining to legacy fare equipment (e.g. transfer machines) with an annual staff budget of approximately $4M.

For emergencies, front-line staff and supervisors in the station can manually open all gates through an override button.

Equity

To ensure access for people with mobility challenges, each station has two wide gates (if one fails) and an additional card reader at an accessible height. All readers are placed for right-handed users, which can cause challenges for some patrons. Travel trainers and on-site staff provide instructions on how the fare gate readers should be used.

Customer Experience

During the recent PRESTO smartcard rollout, the TTC upgraded its fare gates. However, there were multiple issues as people transitioned from tokens and magnetic passes to smart cards. Over time, these issues were gradually resolved, and the transition process became smoother. There was an early learning curve while people figured out how to tap and wait for the gate to open. Checking the balance on the card at the fare gate was a feature added after the implementation of updated fare gates.

The fare gates are designed with clear plastic panels so they are easily visible to customers and do not intimidate them when walking through. As the gates serve both entry and exit, customers may occasionally stop to check if someone is on the other side, but this has not caused any significant congestion. Overall, customer feedback has been positive, although one concern is that it can be challenging to get through the gate with a child under 12, as this customer cohort now rides for free on the TTC.

VANCOUVER

RECENT CONVERSION TO A CLOSED SYSTEM

TransLink has installed fare gates at all SkyTrain (automated light metro system) and SeaBus (ferry) stations, with full operations commencing in 2016. TransLink offers a unique lesson as it is a large transit agency that has transitioned from an open to a closed system on its rapid transit network within the last decade.

Safety

While dealing with fare evasion was one of the main objectives of fare gates implementation, improving the perception of safety was one of the factors as well. There is no clear evidence whether criminal activity went down because of fare gates, but TransLink staff believes that the perception of fairness improved. Looking at Metro Vancouver Transit Police reports, the total number of crimes (both against persons and property) went up the year after fare gates were put in place, but gradually declined afterwards. Systemwide, there were 4,279 crimes against persons and property in 2016, which went up to 4,384 in 2017, and declined to 3,616 in 2019.

In 2022, Metro Vancouver Transit Police reported 3,361 combined property and persons-related crimes. Moreover, when the change in ridership is accounted for, one can see that crimes against persons per 100,000 boardings went down from 0.53 in 2016 to 0.47 in 2017, and further declined to 0.37 in 2019. At the same time, the rate of crimes against property per 100,000 boardings initially increased from 0.58 to 0.6, but then fell down to 0.43 in 2019. Both rates increased early in the pandemic but have returned to pre-pandemic levels in 2022 with 0.54 for crimes against property, and 0.48 for crimes against persons.

Cost

The cost for fare gates was bundled with the implementation of the Compass Smartcard system. The capital program for fare gates was $220M, including installation and a 10-year operations and maintenance period provided by the fare technology vendor. Annual operating costs are approximately $16M.

Fare revenue went up between $20-40M during the first year of operation with fare gates, but this increase can't be fully linked to fare gates. System-wide service improvements occurred at the same time, with a 5% ridership increase.

Integration

The roll-out of fare gates was gradual, with cash and old tickets remaining operational during the transition period. Extensive transfers between the bus and SkyTrain/Seabus system required mode and fare integration with the new smart card system to facilitate transfers in the new closed system.

TransLink implemented a scenario-based approach to understand the impacts of fare gates and avoid surprises. In-station attendants had standard operating procedures updated (e.g. what to do with recovery tickets and what to do during power outages).

Operations

The design, implementation, and maintenance of fare gates and smart fare system were all contracted to Cubic Corporation. TransLink owns the fare gates, and Cubic Corporation is responsible for operations and maintenance which costs approximately $16M a year.

In terms of ensuring access for first responders, all Metro Vancouver Transit Police (MVTP) officers have smart cards that can open the gates, or they can coordinate with station staff to open them. MVTP officers also know how to push through the gates if needed. Moreover, as a procedure, staff can place a station into emergency mode where all fare gates open.

Equity

The implementation of universal accessibility for fare gates was done in stages. Initially, some gates were left open at all times, followed by placing stickers on fare gates with information for those requiring assistance. Additionally, wide accessible gates were installed at all stations.

To further accommodate customers with limitations in accessing smart cards and fare gates, RFID cards and corresponding fare gate infrastructure were tested and later deployed system-wide in 2018.

Customer Experience

The introduction of fare gates, coupled with smart fares, brought about several improvements. These include the automatic loading of funds onto the account, the convenience of different payment types, and the ongoing rollout of additional payment options (such as the ability to pay with a debit or credit card at the gates). Within the first 2.5 months, the uptake of smart fares was at 95% and has remained at that level.

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DEVELOPMENT OF ACCESS TYPOLOGIES

Three access typologies were proposed for study within the LRT system—these included fully closed, partially closed and enhanced staff without fare gates. Developing these access typologies was a required step in identifying potential solutions for fare gate access control on the LRT system. Each typology was evaluated based on various factors based on the project objectives, infrastructure design, and cost parameters. The steering committee provided direction on the access typologies' components with additional feedback from the Calgary Police Service on the enhanced staff model.

Below is a listing of the three typologies assessed in this study.

Option 1: Fully Closed

In this access typology, every LRT station is equipped with fare gates. The 7th Avenue Free Fare Zone is eliminated, where all station platforms become a fare-paid zone beyond the fare gate infrastructure at the entrances to the station. The following functional requirements associated with fare gates are assumed in this access typology:

- Controlled access in and out of the station with fare gates situated within a heated enclosure
- Public side ticket vending machines to purchase transit fares
- Standard and Accessible fare gates
- Staff Operations room for the station attendant with connectivity with station area CCTV cameras and connectivity to Transit Control
- Staff washroom at stations that do not already have this feature

In this model, a station attendant would be at each station for most operating hours of the day with the following duties:

- Customer Service: visibility and assistance to customers (e.g. answering customer inquiries, assisting customers with mobility limitations at fare gates, within stations)
- Fare Collection Support: answering fare-related questions, supporting customers with fare payments, validation, and minor troubleshooting with fare gates. Perform ridership counts, fare surveys and entry/exit counts as required
- Security Monitoring: respond to customer alarms at the station as required, support incident management with Transit Control, PS100 and Emergency Services
- Administrative Reporting: Submit reports on incidents, emergencies, equipment failure and other related information to applicable departments and the Field Supervisor for follow up
- Light Cleaning

Additional staff would be required to support fare gates, specifically in the areas of maintenance, the customer service call centre, and PS100/Transit Control Centre staff.

Option 2: Partially Closed

In this access typology, every LRT station outside the 7th Avenue corridor is equipped with fare gates and the free fare zone is maintained. Stations with fare gates would have the same functional infrastructure requirements as listed in the fully closed (option 1) access methodology. Stations with fare gates would be staffed with station attendants.

Option 3: Enhanced Staff Model

No fare gates would be installed on the LRT system in this access typology. The LRT system would receive additional allocations of outreach, customer service, safety, and law enforcement personnel. Below are the specific assumptions for the enhanced staff model:

- Additional DOAP Transit/Community Outreach Transit Teams (COT) to transition to a new District deployment model
- Integrated transit safety team with dedicated Calgary Police Service resources
- Increased deployment of the Calgary Transit Ambassador Program to increase staff visibility
- Construction of Customer/Safety deployment hubs at identified stations to support the operational components of all staff groups in the enhanced staff model (Transit Peace Officers, DOAP Transit/COT, Calgary Police Service and the Ambassador Program)

CURRENT AND PLANNED STAFFING MODEL

Several groups and programs focused on safety and customer service are presently deployed on the LRT system. This section discusses the current and planned deployment for each group, considerations pertaining to transit safety and assumptions in the development of staffing approaches for the three access typologies (Option 1 - Fully closed, Option 2 - Partially closed and Option 3 - Enhanced staff) that have been assessed in this study.

See **Appendix A** for a complete summary table of the staffing model assumptions.

TRANSIT PEACE OFFICERS

FUNCTIONAL CATEGORY: LAW ENFORCEMENT AND SAFETY

Role

Transit Peace Officers provide for the public security needs of Calgary Transit customers and employees. Their responsibilities entail the following:

- Patrolling Calgary Transit facilities, public vehicles, and property
- Responding to requests for assistance from customers and employees
- Immediately reporting all criminal activity to the Calgary Police Service
- Assisting the Calgary Police Service in deterring criminal activity
- Arresting persons found committing a criminal offense on or in relation to Calgary Transit service, facilities, vehicles, and property
- Executing arrest warrants for persons wanted for statutory, legislative or bylaw offenses
- Transferring arrested persons into the custody of a police officer or transporting arrested persons to Calgary Police Service facilities
- Enforce municipal bylaws and provincial statutes on or in relation to Calgary Transit service, facilities, vehicles, and property
- Promote positive customer and community relations

Transit Public Safety (TPS) is now situated in the City's Emergency Management & Community Safety (EMCS) business unit.

Current

After implementing the 2022 growth package, TPS will have a staff complement of 141 Transit Peace Officers.

Considerations noted for this study

EMCS is reviewing the TPS shift schedule, deployment strategy and integration with Calgary Police Service. A review of Peace Officer authorities is also underway.

Proposal for this study

Integrate with the planned approach from the operational review.

CALGARY POLICE SERVICE

FUNCTIONAL CATEGORY: LAW ENFORCEMENT AND SAFETY

Role

The Calgary Police Service (CPS) supports TPS by responding to calls for service on the transit system that are criminal in nature, as well as responding to community generated issues that stem from people being displaced from LRT and bus shelters. Calgary Police Service must respond to calls on the transit system related to weapons and criminal code offenses (e.g. offenses pertaining to the Controlled Drugs and Substances Act) that are not in the authority of Transit Peace Officers. Unlike Transit Peace Officers, Calgary Police Service members are permitted to travel to an active incident in emergency response mode (e.g. vehicle lights and siren).

Current

Several District level operations are underway for various issues on and near the LRT system that have become a policing issue. The CPS 2023 Annual Policing Plan (APP) that is submitted to the Calgary Police Commission (CPC) has made commitments to address social disorder and criminality on transit and surrounding communities. Pay duty shifts for CPS officers support Transit Peace Officers on specific rotations, particularly supporting the closure of stations at the end of the LRT service day. Transit Peace Officers and Calgary Police Service members share a deployment space at the Stephen Avenue safety hub in Downtown Calgary.

Improvements to organizational communications is a current focus area (e.g. call diversion to TPS).

Planned

Integration discussions are underway with Transit Public Safety.

Proposal for this study

Creation of a dedicated transit resource to work in partnership with Transit Peace Officers to provide a consistent presence as a part of the entire spectrum of law enforcement and security response. This model is currently being developed regarding volume and deployment requirements.

DOAP TRANSIT/ TRANSIT COMMUNITY OUTREACH TEAM (COT)

FUNCTIONAL CATEGORY: COMMUNITY OUTREACH

Role

In 2018, Calgary Transit commenced a pilot program with the Transit Community Outreach Team (COT) where one Transit Peace Officer is paired with one outreach worker from the Downtown Outreach Addiction Partnership (DOAP) team from the Calgary Alpha House Society. The DOAP/COT mandate is to connect Calgary's most vulnerable transit users with services. These services include agency referrals, housing assessments, and connecting individuals with detox and health care services. The DOAP/COT also distributes food, beverages and articles of clothing to those in need on the transit system. Currently, the DOAP/COT team operates in shifts during the early morning, afternoon and early evening. Presently, there is no overnight DOAP/COT team.

Current

4 teams as of February 2023

Considerations

Combined partnership model between Transit Public Safety and Alpha House

Proposal for this study

Increase the DOAP/COT deployment towards a district-based deployment model in the enhanced staff model (option 3).

CORPORATE SECURITY

FUNCTIONAL CATEGORY: SAFETY

Role

City of Calgary Corporate Security Officers provide additional visibility on the LRT system, focusing on keeping people and assets safe and secure. Corporate Security Officers have been assigned to the LRT system as a complement to Transit Peace Officers but do not have the same enforcement authorities.

Current

Up to 31 Corporate Security officers to the LRT system

Considerations

Provides additional safety and visibility resources to the LRT system.

Limited ability to respond to calls for service due to differing authorities when compared to Transit Peace Officers.

Proposal for this study

Maintain planned approach—no change in roles and responsibilities.

STATION ATTENDANT

FUNCTIONAL CATEGORY: CUSTOMER SERVICE

Role

For the fully closed (option 1) and partially closed (option 2) access typologies, a station attendant will be required at stations with fare gates to support operations. The assumed responsibilities of a station attendant will primarily be in the realm of customer service, fare collection support, security monitoring, administrative reporting and light cleaning.

Planned

Presented only as a study option for the fully closed and partially closed access typologies.

Considerations

New job classifications for the City for both station attendants and supervisory staff are required. Facility improvements will be required at all stations with fare gates (e.g. operational rooms at all stations, staff washrooms at some stations).

Additional staffing requirements for fare gate maintenance, customer service centre and PS100/Transit Control Centre will be required for access typologies with fare gates.

Proposal for this study

Proceed for assessment with fully closed (option 1) and partially closed (option 2) access typologies.

CALGARY TRANSIT AMBASSADOR PROGRAM

FUNCTIONAL CATEGORY: CUSTOMER SERVICE

Role

New program deployed by Calgary Transit utilizing existing staff to increase staff visibility on the LRT system and to answer customer inquiries on site.

Planned

Up to 40 staff.

Considerations

The program was recently launched in Q4 of 2022. The program consists of existing staff on accommodated duties. The primary near-term focus of the program is to increase staff visibility on the LRT system.

Proposal for this study

Continue as a program with the Customer and Safety Integrated Model with additional 20 FTEs as discussed in option 3 - enhanced staff.

PARTNER ENGAGEMENT

The project team interviewed several City business units, community service providers and partner agencies to gather insights and opinions on the three access typologies (fully closed, partially closed and enhanced staff model) in December 2022 and January 2023. Each partner was interviewed individually with a set of questions that focused on the potential impacts and opportunities associated with the implementation of fare gates and the requirements and preferences of each organization. The questions also explored the possible changes that may need to be made to existing operational programs and processes from the partner's perspective with the implementation of fare gates. The insights gained from these interviews were documented and analyzed to better understand partner perceptions of the three assessed access typologies and help inform the study's findings.

After the individual partner meetings, the project team organized a half-day site tour of five LRT stations (based on the station groupings) on January 10, 2023. All engaged partners were brought together to discuss the benefits, implications, and trade-offs associated with the fare gate access typologies. The site tour allowed partners to observe and experience the different typologies firsthand and offer their insights and feedback to the broader group. The observations and insights from the site tours were integrated into this final report and documented in the access typology evaluation.

Groups Engaged

To ensure a comprehensive assessment process, engaging with various partners was crucial. The following groups were engaged through this process to understand their perspectives on the potential impact of the three assessed access typologies on their operations.

Calgary Transit Internal Divisions	City Business Units	Emergency Services	City Partners	Community Service Agencies
Transit Service Systems (Communications, Safety & Security, Structures Maintenance & Management and Building Systems)	Emergency Management & Community Safety	Calgary Police Service	Calgary Downtown Association	Calgary Homeless Foundation
Infrastructure	Downtown Strategy	Calgary Fire Department	Kensington BRZ	Calgary Drop-In Centre
Revenue Streams	Community Strategies	Alberta Health Services - Emergency Medical Services	Calgary Municipal Lands Corporation	Calgary Alpha House Society
Transit Service Support (Operations Control, Customer Support, Operational Service Coordination	Community Planning		Calgary Sports and Entertainment Corporation	
Service Technology	Public Spaces Delivery		Calgary Stampede	
	Real Estate & Development Services		Calgary Metropolitan Region Board (Transit Working Group)	
	Green Line			
	Advisory Committee on Accessibility			

Technology Vendors

Three fare technology vendors who operate smart card/ticketing and fare gate infrastructure in other North American cities were also engaged as a part of this study.

Other Engagement

David Cooper, the lead consultant, accompanied the Calgary Police Service, Transit Peace Officers, and the DOAP Transit/ Community Outreach Transit Team in the field to gain insights from front-line staff members on transit safety to inform findings in this study.

STATION GROUPINGS

The project team developed station groupings with input from the City and engineering/architecture partners to address unique contextual and infrastructural challenges posed by different stations. Each grouping was established based on the existing design approach, initial construction era, interactions with neighbouring properties or communities, and access considerations. Variability exists within each grouping based on station-specific factors. Figure 10.1 is a LRT system graphic noting the grouping for each station.

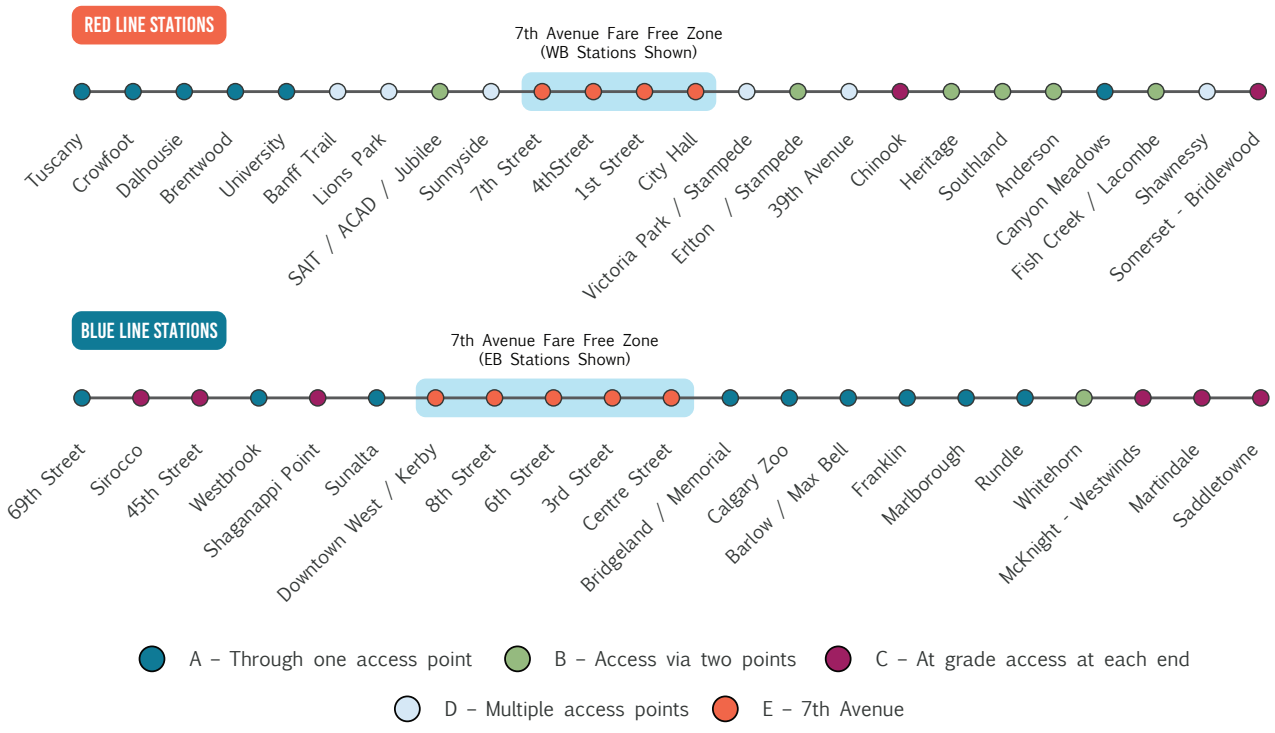


Figure 10.1. LRT system graphic noting the grouping for each station

GROUP A

THROUGH ONE ACCESS POINT

Group A stations are defined by their primary access through a central station head with no secondary access. Multiple accesses may exist to reach the station head, but it is expected from preliminary review that the access management at a Group A station may be achievable with a single checkpoint. There is no expectation in these stations that a wholly new structure or enclosure will be required to manage access or house fare gate equipment. While programming of each station facility has not been reviewed, it is anticipated that staff amenities already exist (e.g. washrooms, staff rooms) to support working from that location. Where insufficient amenities exist, there is a limited level of effort assumed to augment the building to suit introduction of enhanced staff presence.

Variability within the Group will exist with respect to the layout, programming, and vintage of the station head structures that may make retrofit for fare gates more, or less, costly. Depending on the process flow of the station, more than one checkpoint may be required (e.g. Westbrook, 69th Street). It is assumed that existing emergency access points, typically at the end of the platform, will be maintained but not gated.

Figure 10.2 is an illustration of a Group A station with fare gates. Note: Illustrations are indicative of a potential access management solution and not intended to communicate design preferences.

Figure 10.2. Artist's rendition of a Group A station with fare gates

Group A consists of:

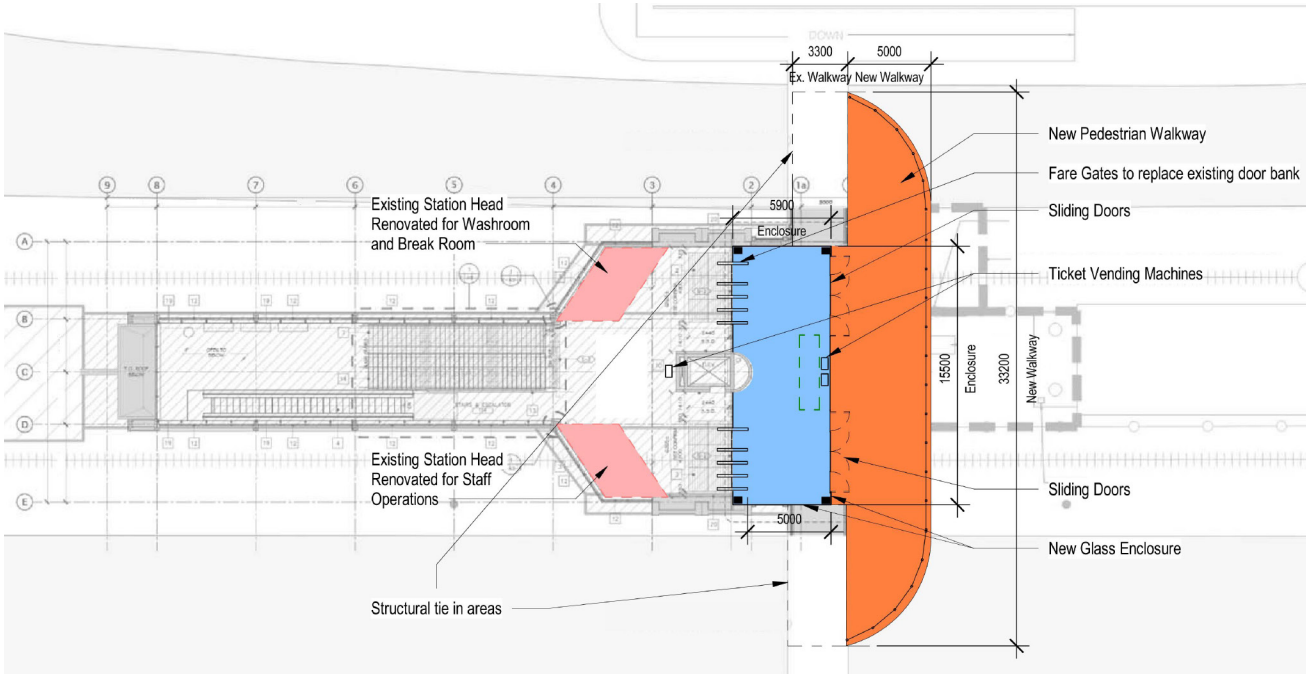
Red Line	Locational Parameters	Blue Line	Locational Parameters
Tuscany	1 Access, Centre Load Platform	69th Street	2 Accesses, Centre Load Platform
Crowfoot	1 Access, Centre Load Platform	Westbrook	2 Accesses, 2 Side Loading Platforms
Dalhousie	1 Access, Centre Load Platform	Sunalta	2 Accesses, Side Loading Platforms
Brentwood	1 Access, Centre Load Platform	Bridgeland / Memorial	1 Access, Centre Load Platform
University	1 Access, Centre Load Platform	Calgary Zoo	1 Access, Centre Load Platform
Canyon Meadows	1 Access, Centre Load Platform	Barlow / Max Bell	2 Accesses, Centre Load Platform
		Franklin	1 Access, Centre Load Platform
		Marlborough	1 Access, Centre Load Platform
		Rundle	1 Access, Centre Load Platform

Access Control Approach

The access control approach for Group A stations is a single checkpoint to enter the existing station head. A portion of the station head will be utilized for a new enclosed and conditioned fare gate shelter comprising approximately eight (8) fare gates in total - six (6) standard fare gates and two (2) accessible gates. It is anticipated that an expanded bridge structure will be needed for stations located in a roadway median (e.g. Marlborough) to maintain functionality of the structures for regional connectivity and to provide increased capacity for pedestrian storage / queuing.

This implementation may vary from station to station. Budgets account for new glass curtain wall enclosures, structural improvements to expand station access/landings, and a generic allowance for additional siteworks to integrate the new infrastructure into the surrounding urban realm.

Figure 10.3 below depicts the potential access and infrastructure approach for Group A stations



GRADE SEPARATED STATION ACCESS

EQUIPMENT	QUANTITIES	AGG. EXIT WIDTH
FARE GATE	6	3740 mm
ACCESSIBLE FARE GATE	2	2160 mm
TICKET VENDING MACHINE (INCLUDING SHELTERS)	4	-
CANOPY (AREA)	96 m2	-
FENCE (LENGTH,1.5M HEIGHT)	10 m	-
STAFF OPERATIONS (AREA)	17 m2	840 mm

EXISTING EXIT WIDTH	5800 mm
AGG. EXIT WIDTH - FARE GATES	5900 mm

LEGEND

- NEW CONSTRUCTION OF CONCRETE PATHS, RAMPS, AND/OR STRUCTURE
- NEW CONSTRUCTION OF ENCLOSED AND CONDITIONED SHELTER
- NEW SITEWORK
- NEW CONSTRUCTION OF STAFF OPERATIONS AREAS

Figure 10.3. Potential access and infrastructure approach for Group A stations

Staff Support Approach:

The staff support approach for Group A stations assumes that a portion of the station head will be converted to a staff amenity space / customer service, both for passengers entering and exiting the station. Budgets have been developed for new partitions, electrical & mechanical systems, and outfitting for the new uses required in the building. No additional space or structure is allowed for.

Risks/Opportunities:

Due to the nature of the design and estimation approach, a number of risks and opportunities may arise as more detailed analysis of the sites is undertaken:

- Existing space within the station head may not be sufficient for the new proposed uses
- Pending validation of station exiting capacity, there is an opportunity that the existing station head may be able to accommodate new fare gates instead of constructing a new bridge area
- Stations that are underground which may not have similar structural improvements required to improve access
- The proposed improvements/widening to maintain community network connections may not be feasible or could be more extensive or complex.
- Event-based passenger volumes at some stations may necessitate a unique approach to gate configuration or expanded amenity space to support the required staffing.
- Where access to the station head is configured as a breezeway, the extent of bridge widening may be more limited.
- In some cases, a new stand alone amenity building may be required (not all Group A stations have enclosed station heads (e.g. 69th Street).

GROUP B

ACCESS VIA TWO POINTS

Group B stations are similar to Group A stations; however, they have additional outdoor access points introducing additional costs and risks related to fare control equipment installation and weather protection (e.g. Heritage). Outdoor access points are typically also equipped with crossing protection equipment, which could complicate choices for the placement of fare control checkpoints and integration with existing LRT systems.

Group B stations have a wide range of architectural expressions at the station head and exhibit various levels of constraint at level crossings where risks may arise.

Figure 10.4 is an illustration of a Group B station with fare gates. Note: Illustrations are indicative of a potential access management solution and not intended to communicate design preferences.

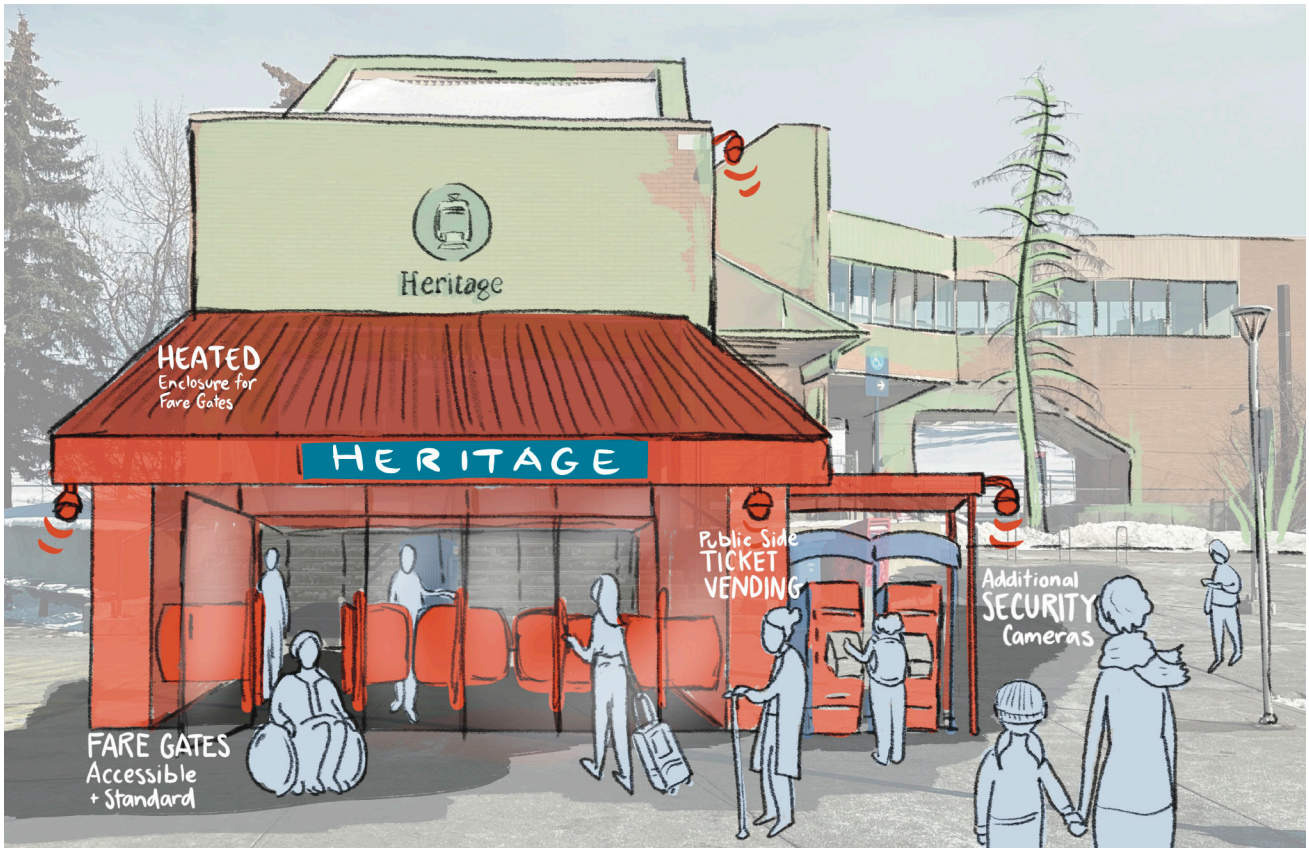


Figure 10.4 Artist's rendition of a Group B station with fare gates

Group B consists of:

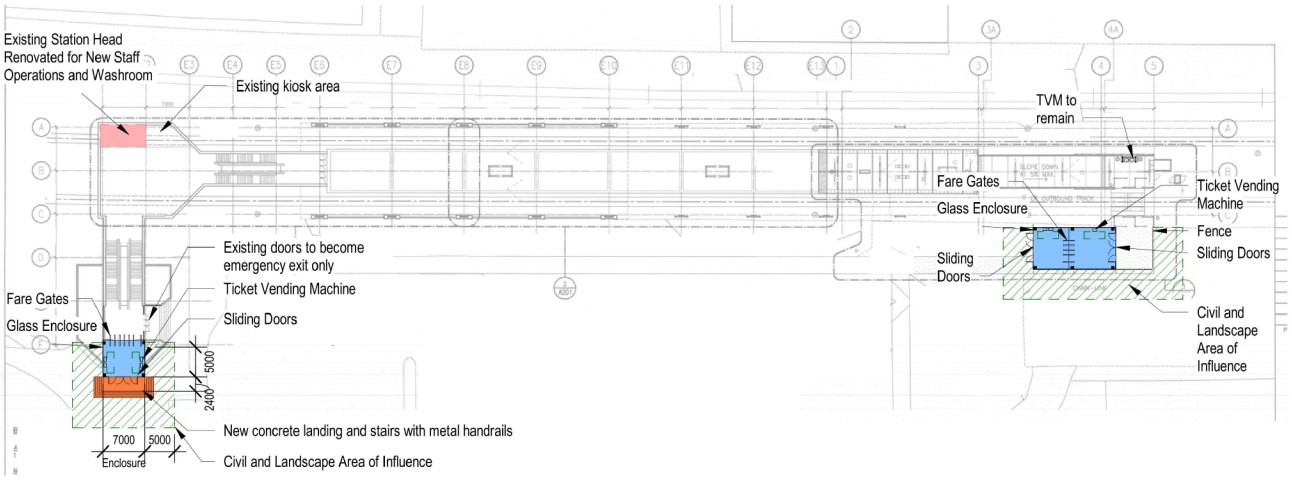
Red Line	Locational Parameters	Blue Line	Locational Parameters
SAIT/AUA/ Jubilee	2 Accesses, Centre Load Platform	Whitehorn	2 Accesses, Centre Load Platform
Erlton Stampede	2 Accesses, Centre Load Platform		
Heritage	2 Accesses, Centre Load Platform		
Southland	2 Accesses, Centre Load Platform		
Anderson	2 Accesses, Centre Load Platform		
Fish Creek – Lacombe	1 Access, Centre Load Platform		

Access Control Approach

The access control approach for Group B stations relies on up to 2 independent checkpoints at each end of the station. At the primary station head location, a glass curtain wall is proposed to expand the station head building, including allowances for mechanical, electrical, and structural improvements. Access control at the level crossing point for each Group B station will be provided by a new semi-enclosed facility to maintain minimum equipment temperatures for the gates. A similar glass enclosure style is assumed at this time.

Station head access points are assumed to require six (6) fare gates, and level access points are assumed to require four (4). Group B stations are typically assumed to require a total of ten (10) fare gates, two (2) of which will be 'accessible'.

Figure 10.5 below depicts the potential access and infrastructure approach for Group B stations.



GRADE SEPARATED STATION ACCESS

EQUIPMENT	QUANTITIES	AGG. EXIT WIDTH
FARE GATE	5	3120 mm
ACCESSIBLE FARE GATE	1	1080 mm
TICKET VENDING MACHINE (INCLUDING SHELTERS)	4	-
CANOPY (AREA)	92 m2	-
FENCE (LENGTH,1.5M HEIGHT)	32 m	-
STAFF OPERATIONS (AREA)	18 m2	840 mm
STAFF WASHROOM (AREA)	7 m2	840 mm

EXISTING EXIT WIDTH	4000 mm
AGG. EXIT WIDTH - FARE GATES	4200 mm

AT-GRADE STATION ACCESS

EQUIPMENT	QUANTITIES	AGG. EXIT WIDTH
FARE GATE	6	3740 mm
ACCESSIBLE FARE GATE	2	2160 mm
TICKET VENDING MACHINE (INCLUDING SHELTERS)	4	NA
CANOPY (AREA)	92 m2	NA
FENCE (LENGTH,1.5M HEIGHT)	12 m	NA

EXISTING EXIT WIDTH	5300 mm
AGG. EXIT WIDTH - FARE GATES	5900 mm

LEGEND

- NEW CONSTRUCTION OF CONCRETE PATHS, RAMPS, AND/OR STRUCTURE
- NEW CONSTRUCTION OF ENCLOSED AND CONDITIONED SHELTER
- NEW SITEWORK
- NEW CONSTRUCTION OF STAFF OPERATIONS AREAS

Figure 10.5. Potential access and infrastructure approach for Group B stations

Staff Support Approach:

The staff support approach for Group B stations assumes that a portion of the station head will be converted to staff amenity space and customer service. No staff amenity space will be provided near the additional level crossing access point. Budgets have been developed for new partitions, electrical & mechanical systems, and outfitting for the new uses required in the building. No additional space or structure is allowed for.

Risks/Opportunities:

- Existing space within the station head may not be sufficient for the new proposed uses
- Pending validation of station exiting capacity, there is an opportunity that the existing station head may be able to accommodate new fare gates instead of constructing a new enclosure area.
- Event-based passenger volumes may necessitate a unique approach to gate configuration or expanded amenity space to support the required staffing.
- Additional buildings and facilities on site may require more extensive integration work than envisioned.

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GROUP C

AT GRADE ACCESS AT EACH END

Group C stations typically include no substantial station head structure and contain up to four discrete points of access to the station overall. These stations generally are well integrated into the surrounding community. However, they benefit from focused access points to the property. These stations are grouped largely due to the lack of substantial enclosed space for staff amenities or equipment. These stations are expected to require the addition of one or more heated enclosures and the addition of significant staff amenity spaces.

Variability will exist within this group based on the number of access control points required, with some limited to one (e.g. Chinook) and others where as many as four separate access points will need control equipment (e.g. Sirocco, 45th Street). Given these stations' integration into the local landscape, space for staff amenity structures may be limited.

Figure 10.6 is an illustration of a Group C station with fare gates. Note: Illustrations are indicative of a potential access management solution and not intended to communicate design preferences.

Figure 10.6 Artist's rendition of a Group C station with fare gates

Group C consists of:

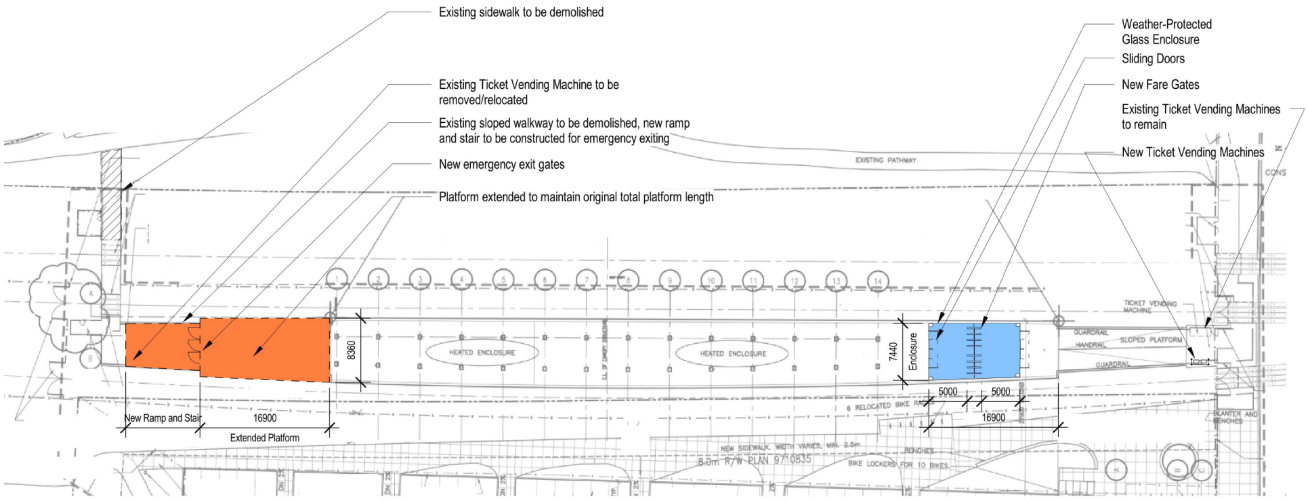
Red Line	Locational Parameters	Blue Line	Locational Parameters
Somerset Bridlewood	2 Accesses, Centre Load Platform	Sirocco	Up to 4 Accesses, 2 Side Loading Platforms
Chinook	1 Access, Centre Load Platform	45th Street	4 Accesses, 2 Side Loading Platforms
		Shaganappi Point	2 Accesses, 2 Side Loading Platforms
		McKnight – Westwinds	1 Access, Centre Load Platform
		Martindale	2 Accesses, 2 Side Loading Platforms
		Saddletowne	2 Accesses, Centre Load Platform

Access Control Approach

The access control approach for Group C stations is similar to that used for level access points on Group B stations, providing new semi-enclosed buildings at each existing access point. Due to the integrated nature of most Group C stations and the frequent overlap of station access with regional mobility, existing station platform areas are assumed to be the location for these new structures. As such, additional costs are included to address the potential need for station platform extensions, LRT system adjustments (e.g. signals, poles) and egress revisions.

A total of seven (7) fare gates – six (6) standard gates and one (1) accessible gate is assumed at each Group C station, distributed over the access points protected in each station.

Figure 10.7 below depicts the potential access and infrastructure approach for Group C stations.



LEGEND

- NEW CONSTRUCTION OF CONCRETE PATHS, RAMPS, AND/OR STRUCTURE
- NEW CONSTRUCTION OF ENCLOSED AND CONDITIONED SHELTER
- NEW SITEWORK
- NEW CONSTRUCTION OF STAFF OPERATIONS AREAS

AT GRADE STATION ACCESS

EQUIPMENT	QUANTITIES	AGG. EXIT WIDTH
FARE GATE	6	3740 mm
ACCESSIBLE FARE GATE	1	1080 mm
TICKET VENDING MACHINE (INCLUDING SHELTERS)	2	-
CANOPY (AREA)	64 m2	-
FENCE (LENGTH,1.5M HEIGHT)	20 m	-
EMERG. EXIT GATE (LENGTH)	8.4 m	5800 mm
STAFF OPERATIONS (AREA)	17 m2	840 mm
STAFF WASHROOM (AREA)	7 m2	840 mm

EXISTING EXIT WIDTH	4400 mm
TOTAL AGG. EXIT WIDTH	4820 mm

Figure 10.7. Potential access and infrastructure approach for Group C stations

Staff Support Approach:

Due to the absence of heated and serviced space at Group C stations, the staff support approach assumes a new stand-alone facility/ building outside of the LRT Right-of-Way. Sites for new buildings at each station have not yet been identified and may require additional land to achieve in some cases. Budgets have been developed for a new building including foundations, structure, enclosure, mechanical, electrical and outfitting. Servicing costs are not determined but allowances have been provided.

Risks/Opportunities:

- Urban integration scopes may exceed the area of civil influence allowed for in the estimates and may require greater efforts to integrate with the existing urban realm.
- Station platform extensions to create a fare gate process area may have significant impacts on the rail signaling or other LRT systems.
- New utility services are likely required for stand alone amenity buildings – scale and source of these services are not known.

GROUP D

MULTIPLE ACCESS POINTS

Group D stations have no formal station head and more than four discrete access or egress points, requiring a bespoke design and layout of amenity and access control features (e.g. Sunnyside, Lions Park). To achieve access control for these stations it is expected that, in addition to the challenges presented by Group C, reconfiguration of the station process design or new perimeters of managed public space could be required.

Variability within this group will be significant as each station will require a bespoke design and layout of amenity and access control features to achieve the required functionality.

Figure 10.8 is an illustration of a Group D station with fare gates. Note: Illustrations are indicative of a potential access management solution and not intended to communicate design preferences.

Figure 10.8 Artist's rendition of a Group D station with fare gates

Group D consists of:

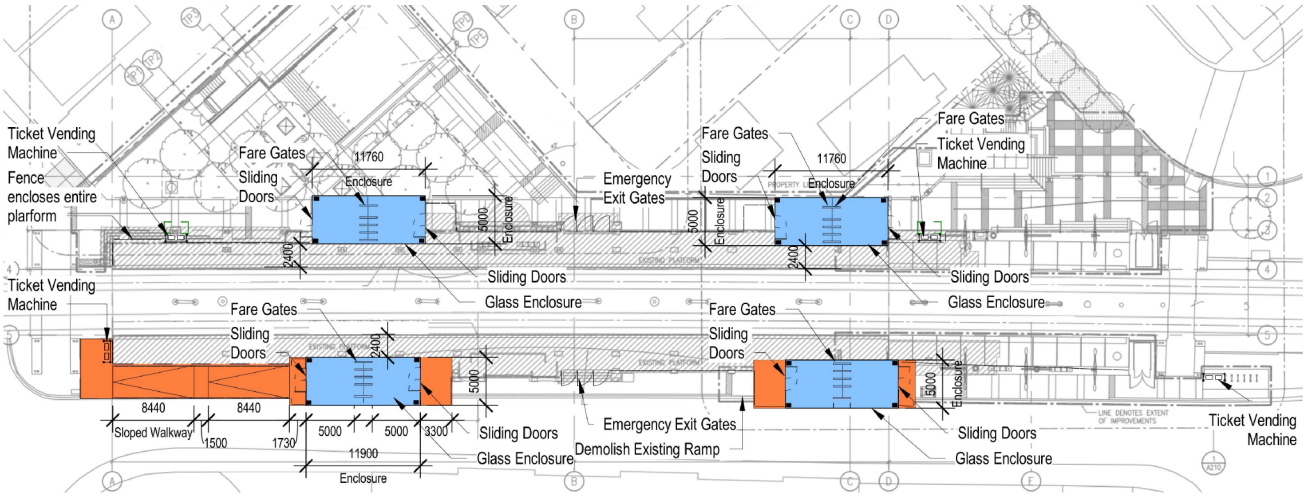
Red Line	Locational Parameters	Blue Line
39th Avenue	2 Accesses, 2 Side Loading Platforms	No stations in Group D
Banff Trail	Up to 4 Accesses, 2 Side Loading Platforms	
Lions Park	4 Accesses, 2 Side Loading Platforms	
Shawnessy	Up to 3 Accesses, Side Loading Platforms	
Sunnyside	4 Accesses, 2 Side Loading Platforms	
Victoria Park-Stampede	4 Accesses, 2 Side Loading Platforms	

Access Control Approach

The access control approach is more complicated for Group D stations as there are numerous access points into the station area and bespoke solutions are required. Because this type of station is heavily integrated into the urban realm, barriers are required to segregate previously integrated space and introduce discrete access points to the platforms. It is assumed that at a minimum, two in-bound points of access and two out-bound points of access are required. Each fare gate enclosure is assumed to house three (3) standard fare gates and one (1) accessible gate, for a total of sixteen (16) throughout the entire station area.

All other areas of urban integration are assumed to be addressed efficiently through fences or barriers. Details of the re-integration of these station types will likely require detailed community engagement and options assessment to mitigate negative impacts or creation of new Crime Prevention Through Environmental Design (CPTED) risks at the station.

Figure 10.9 below depicts the potential access and infrastructure approach for Group D stations.



INBOUND PLATFORM ACCESS

EQUIPMENT	QUANTITIES	AGG. EXIT WIDTH
FARE GATE	6	3740 mm
ACCESSIBLE FARE GATE	2	2160 mm
TICKET VENDING MACHINE (INCLUDING SHELTERS)	4	-
CANOPY (AREA)	86 m2	-
FENCE (LENGTH,1.5M HEIGHT)	78 m	-
EMERG. EXIT GATES	3	4500 mm
STAFF OPERATIONS (AREA)	17 m2	840 mm
STAFF WASHROOM (AREA)	7 m2	840 mm

EXISTING EXIT WIDTH	TBD mm
TOTAL AGG. EXIT WIDTH	10400 mm
FARE GATES	
EMERG. EXIT GATES	

OUTBOUND PLATFORM ACCESS

EQUIPMENT	QUANTITIES	AGG. EXIT WIDTH
FARE GATE	6	3740 mm
ACCESSIBLE FARE GATE	2	2160 mm
TICKET VENDING MACHINE (INCLUDING SHELTERS)	4	NA
CANOPY (AREA)	77 m2	NA
FENCE (LENGTH,1.5M HEIGHT)	80 m	NA
EMERG. EXIT GATES	3	4500 mm

EXISTING EXIT WIDTH	TBD mm
TOTAL AGG. EXIT WIDTH	10400 mm
FARE GATES	
EMERG. EXIT GATES	

LEGEND

- NEW CONSTRUCTION OF CONCRETE PATHS, RAMPS, AND/OR STRUCTURE
- NEW CONSTRUCTION OF ENCLOSED AND CONDITIONED SHELTER
- NEW SITEWORK
- NEW CONSTRUCTION OF STAFF OPERATIONS AREAS

Figure 10.9. Potential access and infrastructure approach for Group D stations

Staff Support Approach:

Due to the absence of heated and serviced space at Type D stations, the staff support approach assumes a new stand-alone facility/ building outside of the LRT ROW. Sites for new buildings at each station have not yet been identified and may require additional land to achieve in some cases. Budgets have been developed for a new building including foundations, structure, enclosure, mechanical, electrical and outfitting. Servicing costs are not determined but allowances have been provided.

Risks/Opportunities:

- Urban integration scopes may exceed the area of civil influence allowed for in the estimates and may require greater efforts to integrate with the existing urban realm.
- Station platform extensions to create a fare gate process area may have significant impacts on the rail signaling or other LRT systems.
- New utility services are likely required for stand alone amenity buildings – scale and source of these services are not known.
- Event-based passenger volumes may necessitate a unique approach to gate configuration or expanded amenity space to support the required staffing.
- Implementing access control at these stations could negatively affect adjacent communities and urban realms due to the extent to which they were considered in their original designs. Re-integration requirements could be extensive.

GROUP E

7TH AVENUE

Group E stations are unique due to their complete integration into building frontages and the 7th Avenue Free Fare Zone, presenting challenges for introducing access control checkpoints.

Group E includes all those stations that exist as part of the 7th Avenue Free Fare Zone from Downtown West / Kerby Station to City Hall. These stations are distinctive from those in Group D through their participation in the unique commercial zone in Calgary's downtown and the challenges presented through the stations' complete integration into building frontages. There will be little to no opportunity to add substantial enclosed space along the corridor to support staff amenity functions. The introduction of access control checkpoints will likely impact access to other public spaces along the corridor. In many cases, the public sidewalk is fully integrated into the station structure, and access points do not exist at discrete locations of any definable quantity.

Variability will be significant among the stations in this group as each is presented within a unique context.

Figure 10.10 is an illustration of a Group E station with fare gates. Note: Illustrations are indicative of a potential access management solution and not intended to communicate design preferences.

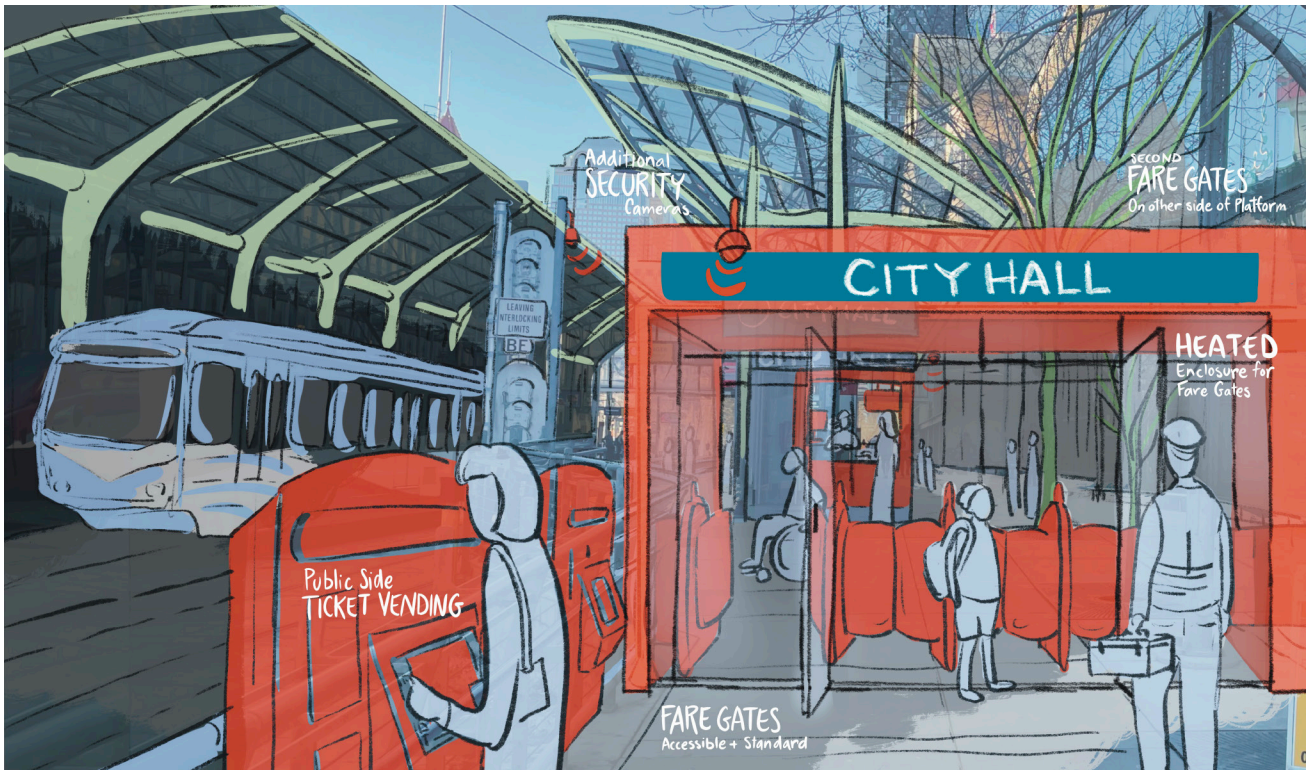


Figure 10.10 Artist's rendition of a Group E station with fare gates

Group E consists of:

Red Line & Blue Line	Locational Parameters	Blue Line	Locational Parameters
City Hall	4 Accesses,2 Side Loading Platforms	Downtown West - Kerby	4 Accesses, 2 Side Loading Platforms
Centre Street	2 Accesses,1 Side Loading Platform		
1ST Street SW	2 Accesses, 1 Side Loading Platform		
4TH Street SW	2 Accesses, 1 Side Loading Platform		
6th Street SW	2 Accesses, 1 Side Loading Platform		
7th Street SW	2 Accesses, 1 Side Loading Platform		
8th Street SW	2 Accesses, 1 Side Loading Platform		

Access Control Approach

Due to the nature of the 7th Avenue Free fare zone, all stations were designed with the intent to be heavily integrated into the surrounding urban realm.

Paired with the density of the Downtown Core, many of these access points are achieved through ramps leading from sidewalks and adjacent properties and buildings along the corridor. Restricting these accesses would impact many local businesses and properties and would restrict pedestrian connectivity.

Although, linear barriers between the loading platform and building frontages may be technically attainable in some cases, they are likely to create more safety risks than they resolve.

Therefore, efforts to develop solutions to implement station closure and restrict access through fare gates along the 7th Avenue corridor did not result in any feasible configurations and is not recommended unless it can be defined to include re-construction of station platforms.

PROJECT OBJECTIVES

City staff and the project steering committee collaborated to develop guiding objectives, creating a framework for assessing and evaluating various fare gate access typologies. The objectives were instrumental in ensuring that the assessment was comprehensive and considered a range of factors, including safety, cost, integration, operations, equity, and customer experience. They also helped to guide the discussion questions during partner interviews and conversations on the station site visits. These guiding objectives were used to assess each typology's potential benefits and trade-offs and identify the most suitable option for the LRT system which is documented in detail in the Access Typology Assessment of this report. The tiles on the following page outline project objectives and guiding questions for the study.

SAFETY

Increase safety on the LRT system

Does the proposed solution enhance safety for customers and staff?

Would it measurably reduce disorder on LRT trains and in stations?

How could fare evasion be impacted?

COST

Efficient use of capital and operating funding

What are the capital cost(s) associated with this model?

What are the ongoing operating costs associated with the proposed model?

INTEGRATION

Maintaining access between the CTrain station and local environment

What are the access model effects on neighbouring communities, developments and public realm?

OPERATIONS

Ability to serve operational needs today and the future

How would Calgary Transit's existing standard operating procedures and policies be impacted by each access model?

How will roles and responsibilities of staff change?

How would future operational considerations be impacted?

EQUITY

Ensuring LRT trains and stations are accessible for all

How would the proposed access model impact those with physical disabilities?

How would the proposed access model impact customers with differing socio-economic backgrounds?

EXPERIENCE

Enhancing the customer journey

How would the proposed solution affect the customer experience when taking a trip on Calgary Transit?

ACCESS TYPOLOGY ASSESSMENT

The project team developed six project objectives which the Steering Committee approved in the early stages of the study. These objectives (Safety, Cost, Integration, Operations, Equity, Experience) provided the evaluation framework to assess the three access typologies (fully closed, partially closed and enhanced staff model). A detailed commentary is provided by objective using the fully closed system as a base typology, notation of the changes to the comparative evaluation with the other access typologies, engagement insights and trade-offs. A visualized roll-up Multiple Account Evaluation table is also provided on page 86. The access typology assessment is detailed below.

SAFETY

INCREASE SAFETY ON THE LRT SYSTEM

Ensuring safety is crucial for public transit systems. We evaluated the goal of enhancing safety on the LRT system by examining the potential effects of the suggested access typologies on customer and staff safety. The main questions aimed to analyze the possible influence of each typology in reducing disorder, deterring crimes against individuals and property and understanding if there is a correlation between fare gates and safety.

GUIDING QUESTIONS

- Does the proposed solution enhance safety for customers and staff?
- Would it measurably reduce disorder on LRT trains and in stations?
- How could fare evasion be impacted?

With the fully closed access typology, the following technical considerations have been identified:

There is no correlation between fare gates and increased transit safety

After assessing five transit agencies with open, partial and closed access typologies with fare gates, there was no correlation between an increased level of safety with having fare gates on the rapid transit system. Transit agency staff noted in interviews that they haven't found a correlation between having fare gates and an increased level of safety. All transit agencies have experienced increased transit safety issues since the beginning of the pandemic.

Fare gates won't solve the broader societal considerations affecting the transit system

City partners who were engaged and transit agencies that were interviewed consistently pointed out that fare gates will not address the considerations of substance use, mental health, and vulnerable unhoused individuals present on the LRT system.

Transit safety considerations will likely not improve with fare gates

Transit safety considerations on the LRT are not likely to improve with the introduction of fare gates. Individuals who undertake unsafe behaviour on the LRT system may still purchase a fare or receive a fare through a community service program.

Here in Calgary, front-line staff documented that individuals conducting drug trafficking on the LRT system purchase transit fare to avoid enforcement action.

Increased resources will be needed for community outreach

Installing fare gates will create an increased demand for DOAP team transports between LRT stations and community service organizations (e.g. Alpha House, Calgary Drop-In Centre).

Significant changes to current outreach programs will be required

City and community service organizations led outreach programs focus on the LRT system, which serves as a focal point for these initiatives.

This includes the DOAP/COT program, where outreach workers routinely locate individuals on the LRT system to provide outreach support. The City's extreme cold weather response also focuses on LRT stations where transportation services are provided for vulnerable individuals to access shelters. Significant program changes will be required for outreach support if fare gates are implemented, restricting access to vulnerable individuals.

TRADEOFFS

Installing fare gates could allow the City to redeploy Transit Peace Officers to reduce time conducting fare enforcement and focus more resources on responding to calls for service on the transit system. Although, since the beginning of the pandemic, Transit Peace Officers have already been shifting resources to focus more on calls for service resulting from the increase of disorder-related occurrences on the LRT system.

ENGAGEMENT INSIGHTS

Partners unanimously agree that they do not want the City to proceed with fare gates. Both City business units and partners shared significant concerns about the potential displacement of safety issues (e.g. disorder moving from transit stations into adjacent communities) that will likely result from introducing fare gates.

EVALUATION SUMMARY

meets objectives | partially meets objective | does not meet objective

Fully Closed	No correlation between the installation of fare gates and increased safety	✗
Partially Closed	Staff at stations will be primarily focused on customer service duties related to fare gates	−
Enhanced Staff	Additional multi-disciplinary staff support from various business units, CPS and social service providers can provide a mobile response system-wide based on needs	✓

$ COST

EFFICIENT USE OF CAPITAL AND OPERATING FUNDING

Efficient use of capital and operating funding is critical for transit systems, especially given the limited resources available to fund day-to-day operations and advance capital projects. The objective to ensure efficient use of funding was included to assess how the proposed access typologies could be cost-effective and financially sustainable.

GUIDING QUESTIONS

What are the capital costs associated with this model?

What are the ongoing operating costs associated with the proposed model?

Capital Cost Estimate

A program level cost estimate has been prepared to help inform the overall impact of introducing fare gates to Calgary. Estimates have been prepared for a partially closed system (all LRT stations outside of the 7th Avenue Free Fare Zone) and for a Safety Hub system (as noted in option 3). These programs are based on Options 2 and 3, respectively, as outlined in the Development of Access Typologies Section of this report. No cost has been prepared for Option 1 (a fully closed system) as no infrastructure basis for an estimate was deemed to be feasible for implementation. Program cost estimates have been prepared for this study, in alignment with the City of Calgary's Capital Project Management Framework (CPMF) Estimation, Contingency and Schedule Standard to a Class 5 level of certainty with an anticipated confidence interval of -50% to +100%. All values are shown as 2023 dollars.

Construction Hard Costs for Designed Elements

As described in the project approach (See Station Groupings, archetypal station design solutions were prepared for the distinct station types. Archetypal design solutions prepared for type A,B,C, and D stations (as well as for staff amenity and customer service spaces) were costed to create a price list for the various repeatable infrastructure elements envisioned for the program. This cost list includes only those elements listed and visible on the schematic plans, with reasonable assumptions made by experienced estimators based on the intended use of each space (lighting, HVAC, structure, etc).

Construction Hard Costs for Risk Elements

Based on the archetypal design approach used on the project, a number of site-specific cost elements could not be captured in typical plans, and are therefore captured as Risk Elements. Risk Elements at each station (e.g. number of fare gates, site servicing, urban integration, structural condition, etc.) were estimated based on the team's past experience, qualitative desktop review of each station, and understanding of how well the selected archetypal solution is expected to suit the station. This process is intended to capture obvious infrastructure elements that are missing from the archetypal solution, clearly not applicable at that station, or required to address a known site context.

Program Soft Costs

Program delivery costs have been accounted for in the estimate as a percent of construction costs as follows.

Item	% of cost
Professional Services (Design, Survey, Project Management, etc.)	18%
Project Delivery (Permits, Fees, Administration, etc.)	3%
Construction Management	5%
LRT ROW Contingency / Operations Impact	10%

CAPITAL COST ESTIMATE OVERVIEW

Option 1 Fully Closed

Item	Cost
Fully closed system is not feasible; no cost has been prepared	

Option 2 Partially Closed

Item	Cost
Construction Hard Costs (Designed elements)	$146,490,000
Construction Hard Cost (Risk Elements)	$62,000,000
Soft Costs	$75,060,000
TOTAL	**$283,550,000**

Estimate Range: $142 M to $567M

Option 3 Safety Hubs

Item	Cost
Construction Hard Costs (Designed elements)	$19,500,000
Construction Hard Cost (Risk Elements)	$2,000,000
Soft Costs	$7,740,000
TOTAL	**$29,240,000**

Estimate Range: $14.6M to $58.5M

Operating Cost Estimate

Two separate staffing models were developed to estimate the annual operating costs for the required staff to support a partially closed system (option 2) and enhanced staff model (option 3). Comparable 2023 City of Calgary compensation rates have been used to determine estimated staff costs. Below is a summary table of estimated operating costs and assumptions by access typology option.

OPERATING COST ESTIMATE OVERVIEW

Option 2 Partially Closed

Staff Role	Annual Cost	Assumptions
Station Attendant	227 FTEs (front-line and supervisory staff): $19.5 Million	Station attendants will be positioned at stations 20 hours a day. Supervisory staff costs are included in the estimate.
Fare Gate Maintenance	10 FTEs: $1.4 Million	Additional front-line maintenance staff to be added to the Calgary Transit – Transit Service Systems staff complement for fare equipment maintenance.
Call Centre	12 FTEs: $1.2 Million	Additional Call Centre staff required to support customers with smart card related inquiries and account management.
PS100/Control Centre	8 FTEs: $0.9 Million	Additional PS100/Control Centre staff for fare gate monitoring and remote issue resolution.
Total Estimated Staff Cost	**$23 Million**	

Option 3 Enhanced Staff

Staff Role	Annual Cost	Assumptions
Additional Community Outreach Transit Team (COT) members	8 FTEs: $1.1 Million	Expansion of the COT team to allow for a district focused deployment model
Additional Station Ambassadors	20 FTEs: $1.4 Million	Additional full-time station ambassadors to increase visibility on the LRT system and to allow for a greater ability to position resources to where it is needed the most.
Dedicated Calgary Police Service Resource	TBD	To be determined as a part of the integration discussions with Transit Public Safety.

INTEGRATION

MAINTAINING ACCESS BETWEEN THE LRT STATION AND THE LOCAL ENVIRONMENT

To ensure that transit systems maintain strong connections with their local environment, nearby properties, and communities within the proximity of stations, integration is essential. The goal of preserving access between the LRT station and its local environment was incorporated to ensure that the suggested fare gate access typologies do not obstruct access or connectivity to adjacent communities, developments, and public spaces.

GUIDING QUESTION

How does the access model affect neighbouring communities, developments, and the public realm?

With the fully closed access typology, the following technical considerations have been identified:

Pedestrian impact on 7th Avenue

Presently, 7th Avenue is a joint transit and pedestrian-only corridor that provides east-west connectivity across Downtown Calgary. In the early 2000s, to facilitate the introduction of 4-car LRT trains and to replace the initial 7th Avenue stations that had reached their end of life, the City invested $183.3 Million in redesign and reconstruction of nine stations. The stations were designed with an open philosophy to allow pedestrians to traverse along the entire corridor, acting as a continuous sidewalk. Installing fare gates would remove 7th Avenue as a pedestrian corridor, which would especially restrict pedestrian connectivity at segments with platforms on both sides of the street, specifically at City Hall and Downtown West-Kerby Stations.

Impact to adjacent developments

Several LRT stations on the 7th Avenue corridor have integrated entrances and accesses with adjacent buildings such as post-secondary institutions, office buildings, shopping centres, a convention centre and several public spaces such as Century Gardens. Placing fare gates would require restricting access points onto the LRT system as the LRT station would become an access-controlled fare-paid zone. City staff have flagged that the City could be subject to claims from impacted property owners by removing existing access between adjacent developments and the LRT system.

Impact on neighbourhood stations

Group D stations (e.g. Sunnyside, Lions Park) are integrated into the local neighbourhood and serve as a focal point for the community.

These stations also act as connection points between communities where residents may have to travel through the station to access one part of the community to another. Notably, at Sunnyside Station, public realm investments on the east side of the station platform would no longer be connected to the station as barriers would be required to control access to the station. Significant redesign of station accesses to facilitate the introduction of fare gates could also limit connectivity for the local area surrounding the station.

Future Green Line surface stations

The future Green Line surface stations are being designed with a low-floor (at sidewalk height), at-grade open system philosophy, which will not be feasible to control station access with fare gates.

Redesign of Victoria Park Stampede Station

Currently under construction, the redesigned Victoria-Park Stampede Station follows an open system philosophy to enhance pedestrian connectivity between the station, Stampede grounds, and Saddledome events. This design takes into account the station's unique peak periods during events. Sunk costs are likely with conducting and constructing another redesign at this station right after the conversion of the station to function as more of an open architecture station.

Alignment to Calgary Greater Downtown Plan

Council approved the Calgary Greater Downtown Plan with one of the strategic moves being "Streets for People." In this strategic move, the City is looking to re-envision street space and public rights-of-way, improve connectivity throughout the Greater Downtown area and invest in the public realm. Implementing fare gates at Downtown LRT stations would work against the City's objectives of increasing mobility options and connectivity for Calgarians by placing a physical barrier to access the transit system and restricting pedestrian connectivity on 7th Avenue.

TRADEOFFS

In a partially closed access typology, there could be an exploration of keeping Victoria-Park Stampede Station as an "open" station reflecting the special event nature of the station, current redesign and construction.

ENGAGEMENT INSIGHTS

There was strong support amongst City business units and external partners to maintain an "open" design approach for the entire LRT system. Significant concerns were raised about the utility of 7th Avenue remaining as a pedestrian corridor and its impact on local businesses, particularly Downtown and neighbourhood connectivity outside of the Downtown core.

EVALUATION SUMMARY

meets objectives | partially meets objective | does not meet objective

Fully Closed	Substantial integration impacts exist across the LRT system.	✗
Partially Closed	The fare gate capital program and associated impacts on stations along the 7th Avenue corridor are eliminated, and integration impacts remain for neighbourhood stations (particularly Group D stations).	−
Enhanced Staff	No impacts to integration will occur, and existing access is maintained across the LRT system.	✓

OPERATIONS

ABILITY TO SERVE OPERATIONAL NEEDS TODAY AND IN THE FUTURE

The ability to serve operational needs today and in the future is necessary to ensure that transit systems remain efficient and effective over time. The objective to ensure operational needs are met was included to ensure that the proposed fare gate access typologies are compatible with Calgary Transit's existing standard operating procedures and policies and can accommodate future operational considerations and changes.

GUIDING QUESTIONS

How would each access model impact Calgary Transit's existing standard operating procedures and policies?

How would each access model impact future operational considerations?

With the fully closed access typology, the following technical considerations have been identified:

Staff Training

All Calgary Transit staff will require considerable training on the functionality, troubleshooting and operational parameters of fare gate infrastructure and associated fare payment technology.

Familiarization for Emergency Services

Familiarization training will be required for all Calgary Police Service, Calgary Fire Department and Alberta Health Services - Emergency Medical Services personnel on fare gate operational and emergency access protocols to respond to incidents within gated fare paid areas at LRT stations.

Access Control for Emergency Services

Access control at stations with fare gates will be required for all Calgary Police Service, Calgary Fire Department and Alberta Health Services - Emergency Medical Services personnel along with Transit Peace Officers and DOAP Transit/COT members.

Throughput at Special Event Stations

There will likely be challenges in managing event-oriented customer throughput during high-demand times at special event stations on the LRT system (e.g. Victoria Park-Stampede, Erlton-Stampede and Banff Trail stations).

Calgary Transit may have to operate these stations with open fare gates and additional staff for fare inspection during peak customer demand depending on the throughput requirements.

Impact on Calgary Transit's overall Fare Strategy

The introduction of fare gates will necessitate the introduction of a corresponding smart fare technology (e.g. smart cards, account-based fare payment) which will require significant financial and operational resources in the planning, procurement and implementation of a new smart fare system. Regional transit partners connecting to Calgary's LRT system will likely have to adopt the same smart fare technology to support fare and service integration.

Impact to Fare Collection

Calgary Transit's fare collection processes will substantially change regarding the conversion of fare media, revenue tracking, fare collection infrastructure maintenance and more.

Impacts to Green Line

Surface and subterranean property impacts for the Green Line LRT have been confirmed. The provision of implementing fare gates at the 7th Avenue underground Green LRT station can not be accommodated without acquiring additional property.

TRADEOFFS

There is a significant linked decision with implementing a smart card/open payment fare collection system with fare gates. Event-oriented customer movements at special event stations may require alternative approaches to manage throughput (e.g. on-site staff and visual fare inspection).

ENGAGEMENT INSIGHTS

There was strong support amongst City business units and external partners to maintain a consistent operational approach between the Red, Blue and Green Line LRT lines regarding station access. City partners such as the Calgary Stampede and Calgary Sports and Entertainment Corporate stressed the importance of maintaining customer throughput at special event stations.

EVALUATION SUMMARY

meets objectives | partially meets objective | does not meet objective

Fully Closed	Significant operational changes exist for both Calgary Transit staff and partners. Additionally, there is complexity in accommodating future operational needs (e.g. Green Line and Regional Transit)	✗
Partially Closed	Changes to Calgary Transit's Standard Operating Procedures and access control for both Calgary Transit staff and emergency responders is still required.	✗
Enhanced Staff	There will be minimal change from current operations. This is the most flexible model to accommodate future changes.	✓

EQUITY

ENSURING LRT TRAINS AND STATIONS ARE ACCESSIBLE FOR ALL

An equity lens is a must for any transit system that is accessible and inclusive for all members of the community, including those with physical disabilities and those from differing socio-economic backgrounds. The objective to ensure equity was included to ensure that the proposed fare gate access typologies do not negatively impact accessibility and inclusivity.

GUIDING QUESTIONS

How would the proposed access model impact those with physical disabilities?

How would the proposed access model impact customers with different socio-economic backgrounds?

With the fully closed access typology, the following technical considerations have been identified:

Changes for customers with physical and cognitive disabilities

Fare gates would substantially change station access for customers with physical and cognitive disabilities. Provisions for accessible fare gates, hands-free technology for fare collection and additional wayfinding will be required with the implementation of fare gates.

Changes to Travel Training

Calgary Transit's Travel Training program will need to be updated to include customer familiarization with fare gates and new fare technology.

Impacts to the City's Equity-Based Programs

There will be complexity in the delivery of equity-based programs (e.g. fair entry and tickets to community service agencies). Participants in the fair entry program will be required to be issued new fare media with differential visual or audible characteristics on their smart fare cards to assist with fare compliance. Approximately 70 community service agencies receive 70,000 single-use transit tickets through the Participation and Integration into the Community (PIC) program. Significant changes would be required for the continuation of the PIC program, as single use paper tickets would be eliminated with the adoption of smart fare technology.

Elimination of the Free Fare Zone

Implementing fare gates would necessitate the elimination of the 7th Avenue Free Fare Zone. The segment of the LRT system is heavily relied upon by the vulnerable population (e.g. citizens who are unhoused), and this segment of the system provides access to several community service agencies. With the removal of the free fare zone, there will be an increased reliance on the PIC program and the DOAP Team.

TRADEOFFS

There will likely be complexities in the administration and fare compliance for smart card-based fair-entry pass products. With the recent introduction of children 12 years of age and under to ride free on Calgary Transit, it is not feasible to issue children free fare smart cards. Visual fare inspection at staffed fare gates on the LRT system will be required.

ENGAGEMENT INSIGHTS

Concerns were expressed by community service providers about the impact to vulnerable Calgarians who rely on the Free Fare Zone to access services. Several accessibility concerns about the implementation of fare gates were identified by the Advisory Committee on Accessibility.

EVALUATION SUMMARY

meets objectives | partially meets objective | does not meet objective

Fully Closed	There will be a significant impact on customers with physical and cognitive disabilities when accessing the LRT system. Elimination of the Free Fare Zone will have a negative impact on vulnerable Calgarians.	✗
Partially Closed	The 7th Avenue Free Fare Zone is maintained, which supports some of the travel needs of vulnerable Calgarians.	−
Enhanced Staff	No changes to accessible design considerations, fair entry and PIC programs are required.	✓

CUSTOMER EXPERIENCE

ENHANCING THE CUSTOMER JOURNEY

A positive customer experience is vital for making transit systems an appealing and user-friendly transportation option. There are 11 moments in the customer experience journey for a transit customer. These moments include planning your route, pre-departure, first-mile, payment, waiting, in-system navigation, making connections, last mile, return trip and post-travel/future planning. Changes to station access impacts six of these moments when it comes to trip planning, payment, transferability, decision making during the trip and data inputs from your overall journey. The goal of improving the customer journey was incorporated to ensure that the proposed fare gate access typologies contribute to an enhanced customer experience when using Calgary Transit.

GUIDING QUESTION

How would the proposed solution affect the customer experience when taking a trip on Calgary Transit?

With the fully closed access typology, the following technical considerations have been identified:

Changes to Customer Experience Moments

Fare gates would require modifications in several customer experience moments including changes in payment methods, trip planning, in-system experience and in-system navigation.

Maintaining a high degree of transferability between the Bus and LRT

The Calgary Transit Bus and LRT network is highly integrated city-wide, necessitating the need for high levels of transferability between these two modes for customers to complete their trips. Seamless transferability will be required for both fare payment and access at LRT stations.

Continuous Customer Communications

Communications notifying regular and occasional customers on purchasing smart fares and interacting with fare gates and general fare rules will need to be continuous.

Enhanced ridership data collection

Smart fare and fare gate systems do provide an opportunity to collect full origin and destination data by customer (in a tap-on and off scenario), which can enhance Calgary Transit's ability to monitor ridership trends and make service adjustments based on demand.

Ability to change fare policy

Introducing a smart fare paired with either a fare gate or validator technology could allow for future changes in fare policy, most notability fare by distance or zone-based fares.

Impact of new station barriers on customers

The challenging urban integration of barriers and gates may negatively impact the experience of transit customers as they arrive and depart from stations.

TRADEOFFS

Changes to fare policies (e.g. distance-based fares, zone-based fares) could also be implemented with fare validators without fare gates. Fare gates will impact most Calgary Transit customers due to the existing extensive transit network design of transferability between the Bus and LRT system.

ENGAGEMENT INSIGHTS

City partners identified that the enhanced staff model has several benefits, including assisting customers with their individual and unique needs.

EVALUATION SUMMARY

meets objectives | partially meets objective | does not meet objective

Fully Closed	Some technological enhancements (e.g. origin/destination data, changes in fare policy) could result in future changes that improve the customer experience.	partially meets objective
Partially Closed	Same as the fully-closed system, except there will be limitations in collecting origin/destination data by not having fare gates on the 7th Avenue corridor.	partially meets objective
Enhanced Staff	Additional on-site assistance could be made available for customers where staff could tailor responses to specific customer needs.	meets objectives

MULTIPLE ACCOUNT EVALUATION

The Multiple Account Evaluation (MAE) table provides a visual summary of the performance of each of the three fare gate access typologies against the six project objectives. The table allows a quick comparison of each typology's assessment across all objectives. The MAE table serves as a valuable visual tool for evaluating the effectiveness of each access typology.

	Safety	Cost (not scored)	Integration	Operations	Equity	Experience
1 Fully Closed	✗	not feasible	✗	✗	✗	−
2 Partially Closed	−	see costing	−	✗	−	−
3 Enhanced Staff	✓	see costing	✓	✓	✓	✓

✓ meets objectives

− partially meets objective with trade-offs

✗ does not meet objective

ENGINEERING AND RISK CONSIDERATIONS

Egress Capacity

Risks are introduced when fare gates are implemented into spaces that were once barrier free. Per the requirements of National Fire Protection Association (NFPA) 130, the following emergency egress criteria must be considered for further examination and validation at each of the following station groups. If station egress and safety concerns are resolved favourably, some assumed infrastructure elements may be avoidable, reducing the capital intensity of a station closure program.

- For station Groups A, B and C, impacts on timed egress relative to passenger flow rates at both station head entrances and at-grade trackway crossings.
- For station Group B, impacts on timed egress relative to distance travelled to a point of safety beyond the fare gate facility located at the entry/access point to the at-grade trackway crossing.
- For station Group C, impacts on timed egress through the new emergency gates and at-grade trackway crossings (LRT and heavy rail).
- Lastly, for station Group D, impacts on the numbers and types of emergency egress points outside of the 4 new fare gate facilities to maintain adequate egress capacity on both inbound and outbound platforms.

Further studies should be completed to analyse unique egress capacities of each station to determine the required amount of fare gates and whether further measures should be taken so as not to negatively impact overall egress rates. Egress capacity is assumed to add various levels of risk in the following ways:

- During an emergency there is potential risk and points of conflict at the fare gates with exiting transit riders and entering emergency service crews.
- Queueing in counterflow/peak period events where fare gate throughput (especially in a gate malfunction scenario) causes conflicts between boarding and alighting passenger movements when, for example, alighting passengers are trying to reach connecting buses and boarding passengers are trying to catch a train.
- Fare gate reliability and redundancy can negatively impact egress functionality and should be well understood as part of any future study.

Fare Equipment Resilience/Durability

The environmental conditions required for various fare gate products to reliably operate is not consistent among vendors. The infrastructure solutions described as part of this study assume a target minimum temperature for this equipment of approximately -10 C. In Calgary, this target temperature requires the provision of a semi-enclosed building to house fare gates which must include heat and ventilation, doors, and lighting.

- Replacement of parts & ordering/stocking of spare parts will require staff and space to administer. Details of this requirement are not currently understood and may vary based on the product selected.
- Facilities required to house and protect the fare gates may become targets for vandalism and property damage, and may in fact create more opportunity for anti-social behaviour within the public sides of each enclosure. New building spaces provided as part of a system closure program will need to be developed with these risks in mind, and be designed for hard use.

Archetypal Design Approach

An archetypal design approach was used for this study to allow for a non-site-specific designs to inform program level costs.

Due to the wide range of architectural expressions present in Calgary's LRT stations, it is inevitable that not every station will fit perfectly into a station type. This study has taken a conservative approach in developing designs to each station type, aiming to develop inclusive solutions that meet the needs of as many group member stations as possible.

To achieve better cost and risk certainty on this topic, a station specific schematic design study must be undertaken. Major risks encountered with respect to the archetypal design approach include:

- The servicing, functionality and condition of each station has not been assessed, and the proposed designs assume substantial flexibility in the programming and layout of existing enclosed spaces. Retrofit programs may also introduce risk of scope slip to address items of deferred maintenance or the discovery of unexpected building conditions.
- Services provided at each station will be different and depending on existing infrastructure may require a more extensive retrofit to achieve the appropriate power, water and sanitary requirements for the program.
  - Specifically, station Groups C & D are expected to require new water and sanitary services to accommodate the new staffing amenities and customer service spaces. It is assumed that groups A & B with station heads already have existing services with suitable capacity for the revised use.
- New staff amenity and customer service spaces have not been shown in specific locations at each station. Risk remains around the cost of land and servicing for new amenity buildings, which will require site specific design development to inform.

7th Avenue Free Fare Zone

The way that the 7th Avenue LRT corridor and Free fare zone is integrated into the surrounding downtown realm presents an immense challenge for installation of access control.

Through a number of design workshops, the project team was not able to develop a conceptual solution suitable to represent the corridor for this study. Implementation of a physically enforced fare zone along 7th avenue is not viewed to be feasible without the introduction of intolerable impact on the surrounding properties and citizens, or without completely reimagining the nature of Calgary's downtown LRT infrastructure.

The key considerations that have led to this determination are:

- Access to the platform from the street level is unavoidable in the stations' current configuration and will make enforcement of any closed system extremely challenging
- Stations are integrated into the accesses to many properties and buildings along the corridor; restricting access to these buildings through transit fare payment is not feasible, and may put The City at risk for claims.
- Where stations exist on opposing sides of the same block, restricting access to an integrated station platform could result in eliminating pedestrian mobility for the entire block (City Hall, Downtown West - Kerby).
- Linear barriers between the loading platform and building frontages may be technically attainable in some cases but are likely to create more safety risks than they resolve. This approach will create sidewalk corridors between the building frontages and loading platforms which are expected to be hazardous, unwelcoming and difficult to maintain. Additional risks with this approach include overall station queueing capacity, egress and fire and life safety.

Victoria Park-Stampede Station

Similar technical complexities exist at Victoria Park-Stampede Station. While not considered a part of the 7th Avenue Free Fare Zone, Victoria Park-Stampede Station is viewed to be more similar to 7th Avenue in terms of design and integration challenges than other Type D stations.

Below is a listing of technical considerations at this station:

- Access to the platform from the street level is unavoidable, and will make enforcement of any closed system extremely challenging.
- The station is integrated into the Calgary Stampede Festival area and surrounding public realm. Significant support for maintaining the public integration at this station was communicated by partners engaged on the topic (CMLC, Calgary Stampede, CESC)
- Victoria Park-Stampede station includes large pedestrian refuge areas intended to meet demand for festival and sporting events with their own bespoke peak period demands. Implementation of fare gate enclosures will restrict pedestrian movement through this area.
- Station integration would have to be redesigned in order to meet fare gate requirements; closure of the station is contradictory to the vision and purpose of the current station redevelopment project.
- Victoria Park-Stampede Station is currently under construction.

Transportation Network Integration

Many stations across the Calgary Transit network have been designed and built to consider connectivity between the communities they serve and subsequently share access infrastructure with non-transit users. With the implementation of a closed or partially closed fare gate system, considerations need to be made to maintain this original design intent or replace this functionality with other new infrastructure.

- Where stations use a bridge or tunnel structure to provide access, the full width of the crossing structure should be maintained for regional mobility, or a new bridge should be allowed for to ensure non-transit users of the bridge are not negatively impacted by closure of the transit system
- Where level crossings are provided to facilitate access to the station platforms, these crossings often double as public sidewalks. Stations such as Chinook are examples where public access routes have the potential to be negatively impacted by station access control.

Customer Experience

Customer experience and urban integration impacts must be considered at all station types.

Challenges exist in facilities that are ostensibly for public use, but which employ a limited number of selective barriers to entry (as opposed to just signage) to delineate or differentiate between public spaces restricted to paying (authorized) and non-paying (unauthorized) members of the public. As such, selective barriers (fare gates) require a degree of environmental separation or protection from the elements and this enclosure system may become attractive as a place to loiter or to seek refuge.

Summary of Technical Findings

Below is a summary of the engineering and risk findings:

- A fully closed system is not viewed to be feasible within the scope and context of this study due to the extent of urban integration present at stations along the 7th Avenue corridor and Victoria Park-Stampede Station.
- A partially closed system is viewed to be technically feasible but will likely require substantial modification to most existing stations where significant technical risks are present.
- Validation of site-specific life safety and egress capacities/challenges is required to develop more cost and scope certainty for any proposed access typology program.
- Detailed engineering assessment of each station specific improvement project is required to validate the scope and scale of investments required to achieve a partially closed system.
- Further development and understanding of the fare technology solution is required to advance engineering understanding of the infrastructure costs and risks.

LINKED DECISIONS

Implementing fare gates on the LRT system would create several upcoming linked decisions, a decision whose outcome will impact a future decision for the City.

Potentially linked decisions resulting from the implementation of fare gates are discussed below:

Implementation of a Smart card/Open Payment system in concert with fare gates

As seen with other fare gate systems across the world, a smart card and/or open payment system allows customers to pay fares and access stations through fare gates. Smart cards are a technology-based solution to load and validate fares through a card. These fare payment systems tend to be account-based (e.g. cards can be registered to a specific user and loaded with different types of fare products) and they often also have the ability to collect travel data, such as trip origins and destinations. Several transit systems now have open payment capabilities where customers can pay with a credit or debit card to purchase transit fares.

With Calgary's highly integrated bus and LRT network, a smart card/open payment system with onboard fare readers on the bus system that would be compatible with the fare gate system would be required. An extensive back-end system would be required for payment transactions, revenue tracking and account management.

To ensure an unified fare system that could allow for future fare and service integration, regional transit partners would need to adopt the same smart card/open payment system.

Updates to LRT Design Guidelines.

The introduction of fare gates would necessitate the need to update LRT design guidelines for the inclusion of fare gates particularly with the spatial, systems and accessibility requirements associated with this infrastructure. The City's urban design and public realm plans and policies would also need to be updated to reflect a change in design philosophy associated with access changes resulting from the implementation of a partially closed system.

Inclusion into the City's Capital Planning Program.

A fare gate and corresponding system-wide smart card/open payment program would need to be included in Calgary Transit's future capital budgets for consideration. This program will be likely assessed against other capital projects (e.g. LRT and BRT expansion) seeking finite senior government funding.

New job classifications would be required.

Implementing fare gates would require the development of new job classifications for station attendants and supervisory positions to support station fare gate operations as these positions don't currently exist.

CONCLUSION

This comprehensive report has thoroughly assessed the feasibility of implementing fare gates in fully-closed, partially-closed, and enhanced staff typologies within the City of Calgary's LRT system. This report's findings have indicated there is no correlation between the installation of fare gates and increased transit safety.

A fully closed system is not feasible within this study's scope and context due to the extent of urban integration present at stations along the 7th Avenue corridor and Victoria Park-Stampede Station. A partially closed system is viewed to be technically feasible but will likely require substantial modification to existing stations and significant technical risks are present. There was a unanimous consensus from City partners that they do not want the City to proceed with fare gates.

Instead, the report recommends implementing an enhanced staff model and associated infrastructure to improve transit safety on the LRT system. This approach is expected to provide more flexibility, better resource management, and the ability to adapt to changing conditions within the transit environment.

Moving forward, City staff will look to consider the technical findings presented in this report in the development of a multi-disciplinary transit safety strategy, which will be presented to Council later this year.

By focusing on the enhanced staff model and associated infrastructure, the City will be better equipped to respond to complex societal considerations impacting public transit, such as substance use, mental health, and unhoused individuals, and to create a safer transit experience for all Calgarians.

APPENDIX
STAFFING ASSUMPTIONS TABLE

Functional Category	Law Enforcement and Safety	
Group	Transit Public Safety (TPS)	Calgary Police Service (CPS)
Current	113 TPS Officers	Paid duty support for system closing
Planned	Increased deployment to 141 TPS Officers (+28)	CPS must attend calls related to weapons and the Controlled Drugs and Substances Act
Considerations	New shift schedule being explored	Additional resourcing is being paid through overtime Several District level operations underway for various issues that have become a policing issue Improvements to organizational communications is a focus area (e.g. call diversion)
Proposal for this study	Integrate with planned approach resulting from the operational review	Creation of dedicated Transit resource to address calls for service that can't be dealt with by TPS. Funding to be confirmed.

Community Outreach	Safety	Customer Service	
COT/DOAP TEAM	Corporate Security	Station Attendants	Ambassador Program
3 teams, 4th team in February 2023.	14 as of Feb 2023	Proposed in the Fare Gate Assessment – staff at every station during operating hours	Program launched in Q4 2022
N/A	Up to 31 Guards to be assigned to the LRT System	Presented as a study option	Up to 40 staff
Combined TPS/ Outreach team with Alpha House. Longevity of program is unknown	Provides additional resourcing to the LRT system Limited ability to respond to calls for service due to differing authorities from TPS	Facility improvements required at all stations (e.g. operational rooms at all stations – staff washrooms at some stations) New job classifications for attendants, supervisory staff Substantial operating cost	Accommodated staff are assigned to this program Primarily customer service focus to increase visibility on the LRT system
Increase COT team deployment to align with a district model	Maintain Planned Approach. No change in roles.	Proceed with options 1 and 2 (with fare gates)	Continue as a program with the Customer and Safety Integrated Model with additional FTEs in Option 3