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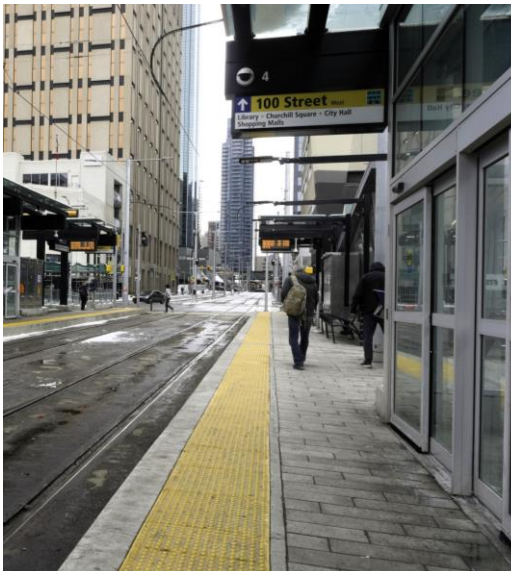

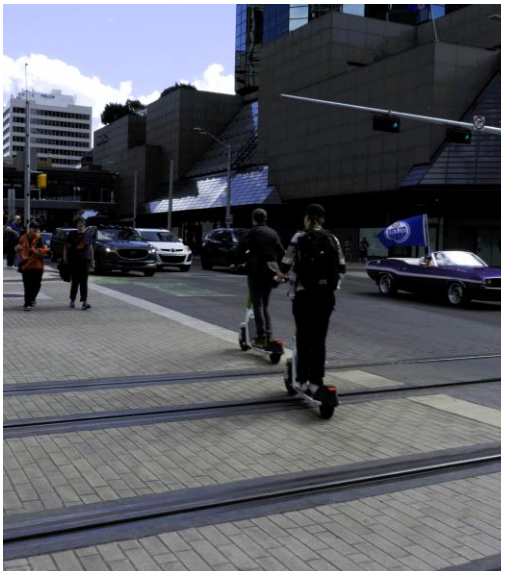

102 Avenue Corridor Evaluation

City of Edmonton

Final Report

November 2024

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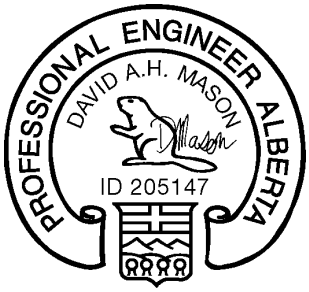


2024-11-13

David Mason (he/him)**, M.Eng., P.Eng.**
Transportation Engineer

Permit to Practice
ISL Engineering and Land Services Ltd.
RM Signature:
RM APEGA ID: 66635
Date: Nov. 13 2024
Permit Number P4741
The Association of Professional Engineers and Geoscientists of Alberta

Table of Contents

1.0 Executive Summary 1

2.0 Project Background 6
2.1 History of 102 Avenue as an LRT Corridor 6
2.2 Purpose of this Report 7
2.3 Changes to 102 Avenue 9

3.0 What We Heard through Engagement 10
3.1 Stakeholder Meetings 10
3.2 Online Survey 11

4.0 Current Conditions 14
4.1 Existing Usage 14
4.2 Winter City 23

5.0 Safety Analysis 24
5.1 Reporting of Collision Incidents 24
5.2 Near Miss Analysis – Direct Observations 32
5.3 Traffic Conflict Analysis – Computer Vision 43

6.0 Conclusions and Recommendations 46

TABLES

Table 5.1: Incidents related to the Valley Line LRT – November 2023 through July 2024 30

Table 5.2: Number of Near Misses Recorded during the direct observation site visits. 34

Table 5.3: Total Conflicts from 24 hour video-capture analysis 44

FIGURES

Figure 2.1: Edmonton LRT Network Plan for Valley Line LRT (Stage 1 Booklet, September 2016) 6

Figure 2.2: Study Area along 102 Avenue 8

Figure 2.3: Before and After Comparison of 102 Avenue at 100 Street 9

Figure 2.4: Before and After Comparison of 102 Avenue at 101 Street 9

Figure 3.1: Survey responses to how often people travel along 102 Avenue 11

Figure 3.2: Survey responses to feelings of being unsafe along 102 Avenue 11

Figure 3.3: A car driving in the bicycle lanes after a fresh snowfall (ISL Engineering) 12

Figure 4.1: Concept Plan for CentreWest Station between 101 and 102 Street, which was renamed as the 102 Street Station (*Downtown Corridor Selection Report*) 15

Figure 4.2: Changes to the total number of daily road users 17

Figure 4.3: Space allocated to each type of road user, at 102 Avenue and 99 Street 18

Figure 4.4: Space allocated to each type of road user, at 102 Avenue and 100 Street 19

Figure 4.5: Space allocated to each type of road user, at 102 Avenue and 100A Street 20

Figure 4.6: Space allocated to each type of road user, at 102 Avenue and 101 Street 21
Figure 4.7: Space allocated to each type of road user, at 102 Avenue and 102 Street 22
Figure 5.1: Locations of all reported collisions 26
Figure 5.2: Collisions by Year and Severity 26
Figure 5.3: Active Mode Related Collisions by Year 27
Figure 5.4: Total Collisions for each study location and in each analysis period 28
Figure 5.5: Intersection Crash Rate (per million vehicles) in each analysis period 28
Figure 5.6: Crash Rate for the entire 102 Avenue corridor in all three analysis periods 29
Figure 5.7: Near Misses and Collisions with LRT along 102 Avenue – November 2023 through March 2024 30
Figure 5.8: Time of year for reported near miss and collision events with LRT vehicles. 31
Figure 5.9: 5 Study areas used for recording near misses and other unsafe acts (Background from Stage 1 Booklet, September 2016) 33
Figure 5.10: Total Number of Incidents across all study sites and observation periods 33
Figure 5.11: Heatmap of Right-Of-Way Violations – Lunch Hour 35
Figure 5.12: Heatmap of Right-Of-Way Violations – Early PM Rush Hour 36
Figure 5.13: Heatmap of Right-Of-Way Violations – Late PM Rush Hour 37
Figure 5.14: Non-Compliance Rate for Bicycle Users 39
Figure 5.15: Near Miss Rate for Bicycle Users (periods with 0 counts had no near-misses involving cyclists) 39
Figure 5.16: Non-Compliance Rate for People Walking 40
Figure 5.17: Near Miss Rate for People Walking 41
Figure 5.18: Computer-aided trajectory assessment of active mode users at 102 Avenue and 100 Street 43
Figure 5.19: Heat Map of conflict locations at 102 Avenue and 100 Street 44

TERMINOLOGY

Throughout this report, various synonyms are used when referring to specific groups of people when they are traveling or enjoying the public space. When possible, the term *road user* refers to all people who are actively traveling between destinations, to distinguish from a person simply using a bench or staying in one place for an extended time.

The table below shows some additional breakdowns and definitions used when referring to sub-groups of road users. These groupings are used to clump road users by their normal speed of movement, but also their total momentum (which can impact the severity of collisions involving this group).

All	Main Groups (and synonyms)	Sub Groups (and synonyms)	
Road Users	Active Users Vulnerable Users	Pedestrian Person Walking	A person walking running using a Manual Wheelchair (pushing themself or by another) pushing a stroller
		Cyclist Bicycle	A person using a bicycle (traditional or electric) a skateboard an e-scooter a mobility scooter roller blades other powered micro-mobility device
	Motor Vehicles Motorists Vehicles	Cars Drivers	A person using a car (sedan, van, SUV etc.) a light truck (pickup truck) a delivery van
		Heavy Vehicles	A person using a tractor (with or without trailer)
	Transit	Bus	
		Light Rail Train	

1.0 Executive Summary

This report has been prepared in response to a City of Edmonton council motion seeking an evaluation of the operations of 102 Avenue, including usage, near misses, collisions and public feedback once the Valley Line LRT has been operating for six months.

The Valley Line LRT has been in development with early visioning starting in 2008. The transit service went into full operation on November 4, 2023 with the six month period ending in April 2024. The analysis period of this report has been extended into June 2024 to capture more of the summer-months activities, such as public space activations and increased cycling activities in the warmer weather.

The purpose of this report is to capture and assess the new normal operating conditions along 102 Avenue, since the area has experienced significant disruption and transformation over the previous 5 to 10 years. The main study area is the entire public realm along 102 Avenue between 102 Street and 99 Street and the main subjects are all road users (motorized and non-motorized) due to the downtown urban context.

The main topics covered in this report are as follows:

- The History of Valley Line LRT development as it pertains to the corridor
- Public perceptions
- Perceptions of stakeholder organizations
- How people move along the corridor
- Collision history analysis
- Near Miss and Road Violations analysis

KEY ACTIVITIES

- The project team followed up on previous stakeholder engagement activities in early 2022. Amongst the groups that were contacted were businesses, organizations, building management and representative groups that are known to have interests within the core downtown area (surrounding Churchill Square) or had interest in public mobility in general. Representatives from Paths for People and the building management team for Canada Place responded to and agreed to meet with the project team. The remaining stakeholders who did not agree to meet were encouraged to complete a public survey.
- An online public survey was prepared and made available between May 27 and June 24, 2024. The survey was advertised via signage within the public area. Over 400 participants completed the survey. Participants were asked questions regarding how often and by what means they travel along 102 Avenue. They were also provided with open ended questions to describe their thoughts and perceptions about the corridor.
- Several site visits (between January 2024 and June 2024) were completed to assess the current conditions of the corridor. Traffic counts were completed in June 2024 specifically for this project, while previously gathered data from June 2023 and prior to 2019 were used. Traffic patterns have been processed and analysed to compare patterns before and after renovations. Specifically, attention was placed on understanding how the number of people using 102 Avenue has changed.

- The collision history along 102 Avenue was assessed. Reported events from two separate sources were used: a) collisions reported to the City of Edmonton (via EPS and collision reporting centres) and b) collisions and near misses gathered by TransEd LRT, the operators of the Valley Line LRT. Collisions were categorized into 3 separate time periods: before construction, soft opening of the corridor and full opening of the corridor. Collision rates (accounting for changing volumes of traffic) have been calculated.
- A near-miss and conflict analysis survey has been completed using two different techniques: a) direct observation and manual recording, and b) video-based trajectory analysis. For the direct observations, 5 separate inspectors surveyed the corridor during 2 separate visits: i) lunch hour and ii) evening rush hour. Inspectors were tasked with recording near miss and unsafe acts, focusing on interactions with vulnerable road users. For the video-based methods, an outside supplier of analysis software was sent files spanning a 24-hour weekday period at 100 Street. Safety metrics, such as Time-To Collision (TTC) and Post-Encroachment Time (PET) were used to categorize and count near miss events.

FINDINGS FROM STAKEHOLDER ENGAGEMENT

Three main themes were shared during stakeholder meetings:

- **Transition of Public Spaces:** The City, and the downtown core specifically, are undergoing changes with increasing numbers of open people-focused spaces, and thus people are adapting to how they use these spaces.
- **Vehicle Traffic Management:** Providing safe routes for motorists into and out of the downtown core remains an important priority, however participants wondered if the space could be better utilized when car volumes are not as high.
- **Driver Experiences:** The changes to the corridor can be confusing and challenging, particularly for accessing parkades and loading docks. Participants were concerned that this confusion results in problematic driving behaviour (using the wrong lanes or not following directions).

FINDINGS FROM PUBLIC SURVEY

Most participants used the 102 Avenue corridor at least several times a week with nearly 9 out of 10 respondents using it at least a couple of times a month.

Some of the main themes received from the public survey include:

- Most participants reported as having unsafe experiences using the corridor.
- **Driver Violations:** Many participants shared concerns about drivers violating traffic rules, such as driving in bicycle lanes, making illegal turns and not properly yielding to vulnerable users.
- **Confusion with the Design:** Several participants expressed that the design of the corridor created confusion for road users and that the uncertainty led to potentially dangerous outcomes.
- **Unsafe interactions:** Many participants described situations they observed where drivers and pedestrians came into conflict. Many noted that pedestrians are crossing against traffic signals and drivers are not checking to avoid cyclists or pedestrians.
- **Potential Improvements:** Participants were asked to share their thoughts on ways to improve the corridor. These suggestions fell into categories such as car-free / pedestrian-friendly measures, means to further separate cars and cyclists, streetscape and landscaping improvements, and mechanisms to enhance the experience when walking in the area.

FINDINGS FROM TRAVEL PATTERNS

Since 2020, the number of cars in the downtown core has dropped significantly. Only the 100 Street intersection has seen motorized traffic volumes approach those seen before 2020, and this primarily due to large demand for traveling north-south along 100 Street.

Throughout the study area, the number of cars using 102 Avenue itself has dropped by a factor of 10 (10% of the original), for example dropping from 5,600 daily cars before 2020 to around 700 daily cars in 2024 (102 Avenue and 100 Street).

Compared to before 2020, pedestrian volumes in the downtown core has been somewhat stable, with slight declines in certain areas.

- The number of people walking has increased at 102 Avenue and 100 Street (6%), possible in relation to the proximity of the Churchill LRT stop, the renovations to the Stanley A. Milner Library and other developments in the area.
- The number of pedestrians has had a moderate decrease in other locations, with a decline of one-in-five (20%) at 99 Street, a one-third decrease (33%) at 101 Street, a two-in-five (40%) decrease at 102 Street, and a one-half (50%) decrease at 100A Street.
- The number of people walking along 102 Avenue has declined at the secondary intersections, but not as sharply as vehicle volumes.

Bicycle volumes cannot be easily compared to the time period before 2019, as counts of bicycles along the whole corridor were not found.

- Within 2024, bicycle volumes are about 1-5% of all road users, and are as high as 13% of users at 99 Street.

FINDINGS FROM COLLISION HISTORY

Due to the limited time since the opening of the 102 Avenue corridor, strong caution must be used when comparing collision patterns across time periods. Obtaining collision data that has been adequately processed, aggregated and assigned to the study area has required simplifying methods to complete within the short turn-around time required. Property-damage only collisions are likely to be under-reported, however injury-related collisions have been adequately gathered.

Nonetheless, during the 6 month period after full opening, there has been a reduction in total reported collisions along 102 Avenue. Reported collisions are primarily those that result in insurable property damage or personal injuries requiring medical attention and are primarily related to vehicle-vehicle collisions.

The total reduction in reported collisions along 102 Avenue may be solely due to fewer number of motorized vehicles in the study area. The rate of collisions (incidents per million vehicles) has reduced at the busier intersections (101 Street and 100 Street), however more data and a longer time period is required to assess whether the secondary intersections (102 Street, 100A Street and 99 Street) have in fact decreased in rate of collisions.

Collisions involving the Valley Line LRT within the study area are primarily related to pedestrians and cyclists, with a smaller number related to motorized vehicles. The report authors are aware of recent news publications regarding motorized vehicle collisions with the Valley Line LRT. Some of the features reported elsewhere along the transit line are also observed within the 102 Avenue corridor: reported near miss incidents primarily involve motorists disobeying signage or traffic signals or pedestrians crossing the path of an approaching Light-Rail Vehicle.

FINDINGS FROM NEAR MISS ANALYSIS

The Near Miss Analysis was focused on identifying the prevalence and location of illegal road movements and so called “jaywalking” behaviours. Throughout the 102 Avenue corridor, there is a higher non-compliance rate for active users when compared to a comparison site elsewhere in downtown Edmonton. Non-compliance is primarily within pedestrian crosswalks where people who are walking don’t want to wait unnecessarily for traffic lights to change.

In general, pedestrians and cyclists are looking out for vehicle conflicts and, when they feel it is safe to cross, opting to disobey the indicated traffic signal and proceed anyway. In the minority of cases, pedestrians are not observant of these risks, and opting to cross the tracks regardless. To discourage this behaviour, the corridor has been built with features (such as elevation changes and tactile surfaces) to communicate that a person is entering an active lane of traffic, however these are only indicative measures (rather than barriers as a preventative measure).

KEY RECOMMENDATIONS

This report is intended to provide information on the current status of 102 Avenue and analysis of the current behaviours. While formal recommendations are beyond the scope of this document (particularly structural changes to the built environment), the following considerations may be beneficial for future planning and implementation.

Under the City of Edmonton’s Safe Mobility Strategy, this report covers 3 of the conventional “5 E’s” approach; Engineering, Evaluation and Engagement have been used as part of this project. The remaining 2 E’s, Education and Enforcement, should continue to be explored to assess their potential benefits along this study corridor and elsewhere along the Valley Line LRT line.

Public feedback has expressed that the corridor is confusing for first-time users as they are unlikely to have experienced a similar roadway before. There is a risk that implementing additional engineering solutions may contribute towards this level of confusion. Great care should be taken to ensure that any changes (large or small) are able to directly address a specific safety issue while not excessively increasing the cognitive load to drivers and other road users.

The following are some small-scale issues that should be investigated:

- Motorists are making illegal turns, (such as right-turns-on-red, left-turns where prohibited, and using the bicycle lane as a motor vehicle) and mechanisms to better direct drivers, by pointing them towards the permitted behaviour, should be explored. The effectiveness of these treatments during winter months (when snow is present) should be assessed. The City’s Traffic Control department is conducting a full signage review of the corridor to determine if additional signage is merited.

- Traffic Signal phasing, actuation and timing should be updated to reduce the wait times for pedestrians and cyclists.
    - Specifically, the Transit Signal Priority system currently utilized, a) does not permit pedestrians to cross while a train is travelling in an adjacent lane, b) holds the “all-red” phase for all non-train traffic for an extended period beyond when the train has fully cleared the intersection, c) holds the Transit Priority for an opposite traveling train when other road users have been waiting for an extended time.
    - As a result, the total “lost time” is unnecessarily large along the corridor, increasing delays and waiting times for all road users. The perceived excessive waiting times results in frustrations and impatience in people using the corridor, who are then more likely to disobey the indicated signal phase.
- The intersection of 102 Avenue and 99 Street is confusing for cyclists, particularly those connecting between the bicycle lanes on 102 Avenue and 99 Street. The intended operation for eastbound cyclists is to use a bike box on the south side of the intersection to continue northbound. During site visits, the project team rarely observed cyclists completing this manoeuvre, possibly because this intent is not clear or that the space for completing a bike box turn is too small. The curbing and concrete barriers present on 99 Street create very a tight space.
- Removing the traffic signals at the secondary intersections (102 Street, 100A Street, 99 Street) should be explored. With the low volume of motor vehicles, the number of conflicts between road users is low and speeds are relatively low as well. The presence of the LRT tracks necessitates some degree of automated signaling system to notify road users of its presence.

2.0 Project Background

2.1 History of 102 Avenue as an LRT Corridor

In 2008-2009, City Council adopted the LRT Network Plan. This set the framework for the general areas of the city that will be serviced by future LRT lines. The plan also specified the desire to adopt a more "urban style approach" to Light-Rail Transit, rather than the high-floor and heavy-rail concept used along the Capital Line. This urban style was selected to better integrate within the urban fabric of Edmonton, while also creating more transportation choices.

There was a desire to facilitate greater connectivity of people and places and provide higher levels of integration with the existing road rights of way. LRT network plan sought to adopt an "urban style approach" to LRT and mass-transit projects. Due to the capacity of the underground LRT system, the south-east section of the network was selected to be surface running through the downtown area.

Figure 2.1: Edmonton LRT Network Plan for Valley Line LRT (Stage 1 Booklet, September 2016)

Between 2009 and 2011, the corridor and route selection process was completed, selecting 102 Avenue through the downtown core. Amongst many reasons, the connectivity to key destinations along 102 Avenue was highlighted.

During this process, the decision was made to provide a dedicated lane for bicycles, which was then incorporated into future streetscape concepts. This trade-off was selected, knowing that the number of lanes for motor vehicles would be reduced to only a single eastbound lane.

By January of 2012, the concept design for the entire downtown section of the Valley Line LRT was approved by Council, detailing the location of stops and the placement of various streetscape features.

In 2013 through 2015, a Public-Private-Partnership (P3) model was selected for delivery of the Valley Line LRT project. A Streetscapes Design Guide was created in 2016, to direct the current and future suppliers when making decisions about the design of 102 Avenue.

With the need to re-build and re-locate many underground utilities, 2016 was the final year in which 102 Avenue would operate as a 4-lane minor-arterial road. Minor closures to specific lanes commenced in 2017 for this underground work, before complete closure of the corridor to public traffic started in 2018.

Construction of the downtown corridor was substantially completed in 2022, however with some sections having previously been opened to non-motorized traffic in 2021. This report considers 2022 to represent a “Soft Opening” of 102 Avenue, when motorized traffic was permitted to return to the public area, however Valley Line LRT operations continued to be in testing modes. A “Full Opening” of 102 Avenue was reached in November 2023 with the Valley Line LRT going into full public service.

2.2 Purpose of this Report

This report has been prepared to support City administration address a council motion seeking an evaluation of the operations of the 102 Avenue corridor (see Figure 2.2 below) for the first six months after the Valley Line LRT enters service. This report aims to provide information and context to describe the “new normal” for the area, considering that the intensity of changes and length of disruption to the area have fundamentally changed how people use the public space.

There are 4 main pillars to this report listed below:

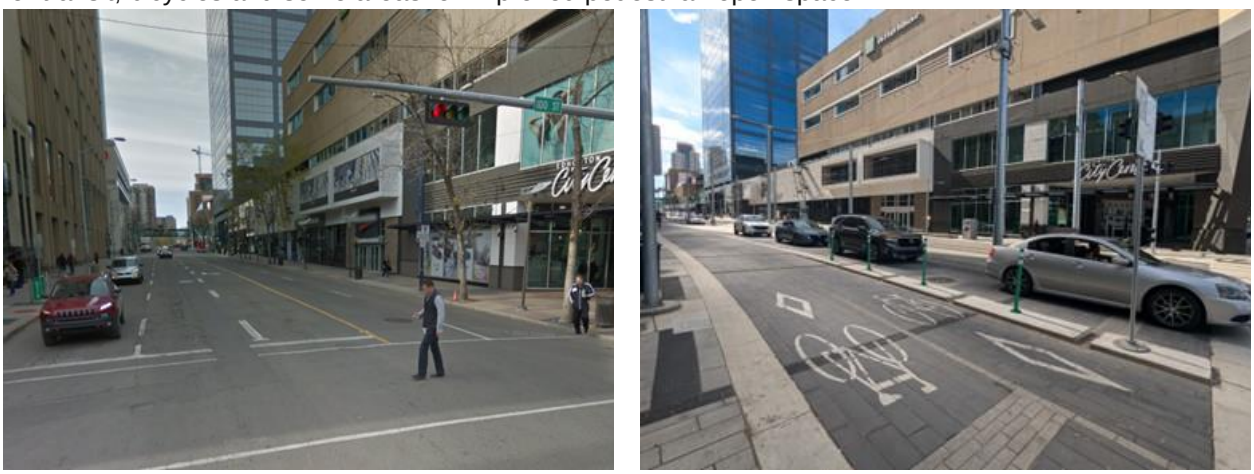
This report’s intent is not to provide recommendations for changes to the corridor, unless there are immediate needs towards public safety or if the potential changes can have a significant impact at a relatively low cost.

Figure 2.2: Study Area along 102 Avenue

2.3 Changes to 102 Avenue

102 Avenue is located directly within the downtown core of Edmonton. The boundaries of this study are 102 Street and 99 Street, focusing on all of the intersections between these limits as well as the road segments connecting these intersections (see Figure 2.2 above). The Quarters neighbourhood and areas east of 99 Street have also been impacted by the LRT construction, and the study team has received public feedback for these areas as well. Nonetheless, collision history and travel patterns for those sections of 102 Avenue were not studied in detail.

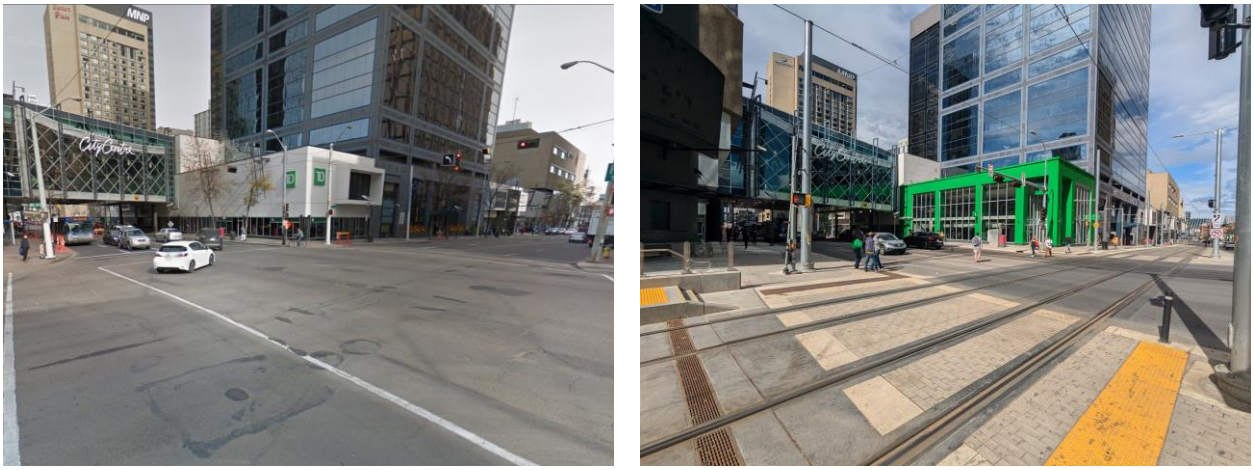
102 Avenue previously operated as a minor arterial road, with 4 total lanes of through-traffic (2 in each direction , plus a left-turning lane at most intersections)(see Figures 2.3 and 2.4 below) The cross section has changed substantially for vehicles, as there is now only a single eastbound lane for the full length of the study area. The right-of-way that was previously available for vehicular traffic has now been allocated for transit, bicycles and some areas for improved pedestrian open space.



Oct 2016
Source: Google Street View

Jun 2024

Figure 2.3: Before and After Comparison of 102 Avenue at 100 Street



Oct 2016
Source: Google Street View

Jun 2024

Figure 2.4: Before and After Comparison of 102 Avenue at 101 Street

3.0 What We Heard through Engagement

One of the key deliverables for this project was to engage and consult with the public and main stakeholders along the 102 Avenue corridor, gathering users' experience after the LRT has been operational for more than six months.

3.1 Stakeholder Meetings

The City conducted stakeholder engagement on this corridor early 2022, with the focus on closing the corridor to vehicle traffic. Using the stakeholder list that was created in 2022, the contact information was updated, and the list refined to include the Downtown Community League. Two emails were sent to the list of stakeholders (listed below) who were previously engaged, one email sent in May and one email sent in June 2024.

- Paths for People
- Don Wheaton YMCA
- Manulife Place
- Downtown Business Association
- City Centre Mall
- Canada Place
- BOMA (Building Owners and Managers Association)
- NAIOP
- Downtown Community League

The Project Team met with representatives from Paths for People and the building management team for Canada Place. A representative from Don Wheaton YMCA contacted the Project Team to gather more information about the study but opted to not meet.

The link to the online survey was included in the invitation and stakeholders were invited to complete the online survey or share with their networks.

The following section is the top themes that were shared during the stakeholder meetings:

- **Transition of Public Spaces:** Participants share changes to 102 Avenue and how it is operating today is a change from a car-oriented space to more of a people-oriented space and people are using the space differently now. Participants witness more people jaywalking, it is a low-speed corridor and maybe should be treated as a shared street, similar to Rice Howard Way.
- **Vehicle Traffic Management:** Participants question if an east/west vehicle lane is required, or could some sections be considered for event-based closures.
- **Driver Experiences:** Participants shared concerns about problematic driver habits such as driving in the wrong direction or wrong lanes. Participants also shared that accessing parkades and loading docks has become confusing and challenging

3.2 Online Survey

An online survey was made available between May 27 and June 24, 2024. The survey was advertised through signage posted throughout the project scope area and hosted on the City of Edmonton's website. The link was also sent to the stakeholders who were encouraged to share with their networks. Over 400 participants completed the survey.

There were nine questions in the survey. Questions included how often they visit the area (Figure 3.1), what modes of travel they use most while on or crossing 102 Avenue, if they have had unsafe experiences on 102 Avenue (Figure 3.2) and two open ended responses asking their experience and how the corridor could be improved. Below are the highlights from the online survey.

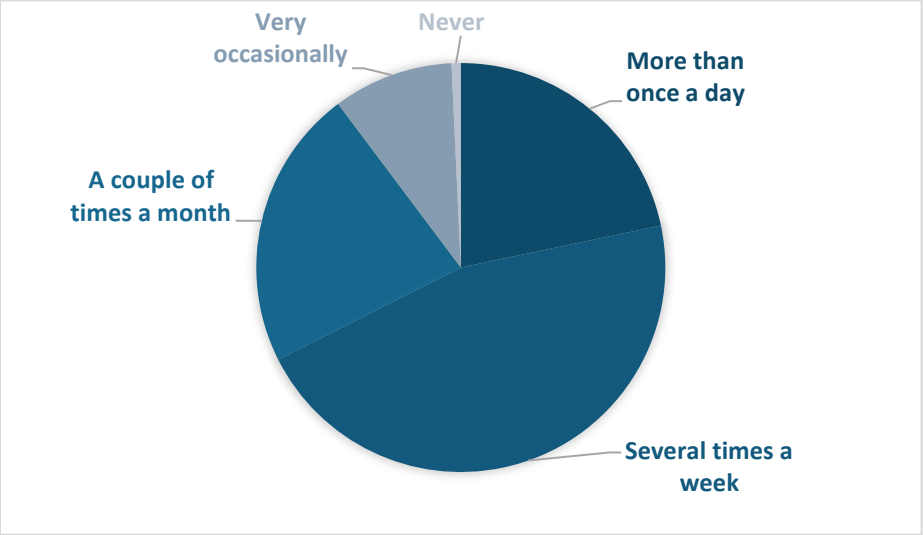


Figure 3.1: Survey responses to how often people travel along 102 Avenue

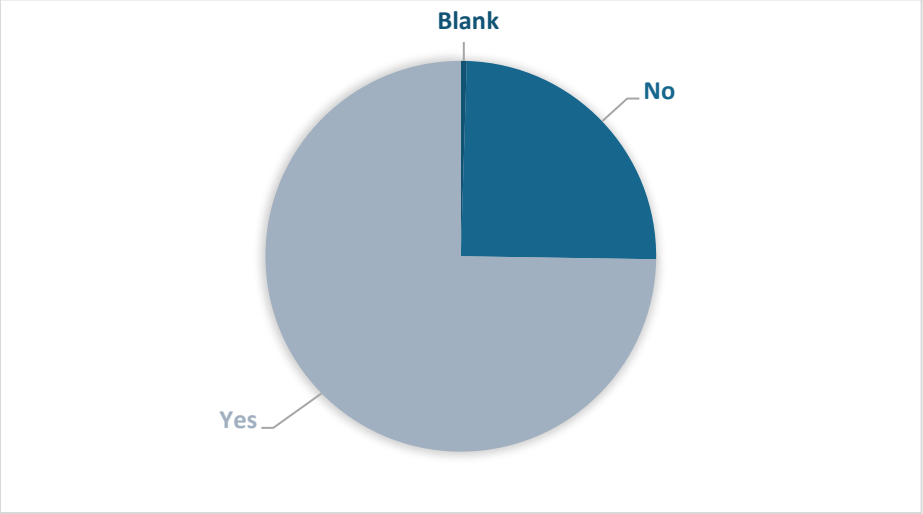


Figure 3.2: Survey responses to feelings of being unsafe along 102 Avenue

The following section lists some of the top themes that were shared within the open-ended questions:

- **Frequent Driver Violations:** Many participants share issues with drivers violating traffic rules, such as driving in bike lanes, making illegal turns, and not yielding to people who are biking and walking in the area. These violations create unsafe conditions for all road users.
- **Confusing Design:** Several participants mentioned that the way the corridor is built results in confusion among drivers, cyclists, and pedestrians. Participants also shared that this section has unclear signage for all users. This confusion leads to dangerous interactions and near misses.
- **Unsafe Interactions at Intersections:** Many participants describe unsafe interactions at intersections, including drivers not checking for cyclists and pedestrians, and pedestrians crossing against signals. These interactions increase the risk of near misses and could lead to increased number of accidents.
- **General Safety Concerns:** Overall, there is a strong sentiment of safety concerns among all road user types. Issues such as near misses, aggressive behavior, and lack of enforcement of traffic rules contribute to a feeling of insecurity.

Figure 3.3: A car driving in the bicycle lanes after a fresh snowfall (ISL Engineering)

The figure above, captured by ISL during a site visit, depicts some of the concerns expressed by survey participants.

Participants were asked to share their thoughts on how the corridor could be improved. The following section is the top themes that were shared:

- **Car-Free and Pedestrian-Friendly Proposals:** Many participants suggest removing car traffic from 102 Avenue to improve safety and accessibility for people who walk and bike. Proposals include car-free weekends or for special events, permanent car-free zones, and better signage to prevent cars from entering bike lanes.
- **Improving Bike Lane Safety:** Suggestions for enhancing bike lane safety include installing solid or retractable bollards, painting bike lanes a distinct color, and creating physical barriers between bike lanes and car lanes. These measures aim to prevent cars from entering bike lanes and ensure a safer environment for cyclists. The project team notes that some of these measures have been implemented in the time between when the survey was conducted and the completion of this report.

- **Enhancing Pedestrian Experience:** Participants highlight the need for wider sidewalks and spaces for people who are walking, better signal controls, and improved cleanliness. Suggestions include expanding pedestrian areas into existing bike lanes, adding crossing arms at train tracks, and ensuring sufficient space for wheelchairs and other mobility devices to make the space safe for people of all ages and abilities.
- **Streetscapes and Environmental Improvements:** Suggestions for improving the overall environment of 102 Avenue include adding greenery and street art. Participants also mention the need for better maintenance of planters and benches, as well as promoting street-facing businesses to activate the area.

Other themes that are not specific to the project but were identified by participants in the online survey and through stakeholder meetings include addressing safety concerns at the LRT stations and throughout the study area and addressing the needs of people experiencing homelessness.

4.0 Current Conditions

4.1 Existing Usage

The new geometry of 102 Avenue has impacted the way the people and vehicles are able to move around within the downtown core. Pages 17 through 21 include a data sheet for each intersection along 102 Avenue, depicting the space within the right-of-way allocated to each road user, accompanied by usage data described later in this report.

MOTORIZED TRAFFIC

Due to the presence of the LRT, left turns from 102 Avenue have been prohibited for the full length of the study area. Right-turns on red have also been prohibited, however right-turns on green are permitted, with vehicles yielding to bicycles in the bicycle lanes. Turns onto 102 Avenue are permitted at all cross streets, however no dedicated turning lanes are provided.

Within the study area, there are no parking lots, no curbside parking, no laneways and no driveways that access 102 Avenue. Immediately outside the study area, east of 99 Street, is a laneway and parking garage access to the Canada Place building. There are also parking garages that access the cross-streets immediately north and south of 102 Avenue, but not directly on 102 Avenue itself. On a few occasions, the project team observed goods delivery vehicles stopped along 102 Avenue and blocking the bicycle lanes.

These movement restrictions have reduced the route choices available for motorists within the downtown core. Any driver traveling towards the west (or arriving from the east) cannot use 102 Avenue and must use alternative routes instead. Further exacerbating the route choice of motorists is the left-turn prohibition at 101 Street, 100 Street and 99 Street. The end result is that motorists traveling east along 102 Avenue must eventually either turn south (towards Jasper Avenue) or continue east before heading north at 97 Street.

As of 2024, construction continues on the Valley-Line West project, situated just west of the study area. Upon completion, the cross-section and turning restrictions along 102 Avenue, west of 102 Street, are anticipated to be similar to that of the now finished portions. However, the ongoing construction is currently restricting route options, thereby reducing the volume of vehicles utilizing the study corridor.

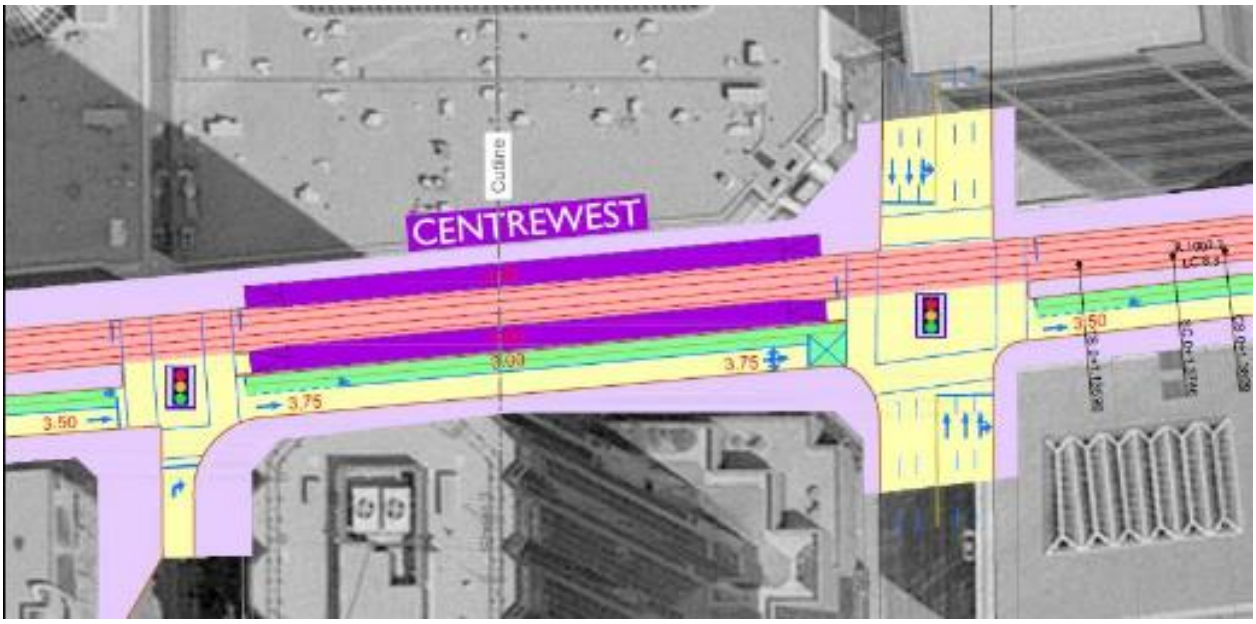


Figure 4.1: Concept Plan for CentreWest Station between 101 and 102 Street, which was renamed as the 102 Street Station (*Downtown Corridor Selection Report*)

The lack of motorized destinations along this corridor, and the reduced route choices within the immediate area has pushed many of the vehicles onto adjacent roads. The traffic conditions along these adjacent roads has not been assessed as it is outside the scope of this report.

VULNERABLE USERS

In contrast to the reduced route choice and freedom of movement for motorists, pedestrians and cyclists now have improved conditions. The fully protected bicycle lanes along 102 Avenue are an attractor for these road users, as it is one of the few AAA (All Ages and Abilities) east-west routes within the downtown core. Cyclists who are not comfortable riding in mixed traffic (such as along Jasper Avenue or 104 Avenue) are more likely to route their travel to 102 Avenue. Once the Valley Line West project is completed, 102 Avenue will have a 3km stretch of continuous protected bicycle lanes (from Connaught Drive to 99 Street, and connecting to other facilities at both ends).

Turning restrictions for people using the bicycle lanes is somewhat unclear from the signage and infrastructure connected to the bicycle lanes. For example, there are “bicycle turning boxes” at 101 Street and 100 Street, that permit cyclists and scooter users to make a “two-stage” left turn, by waiting within this box. There is an informational sign at 99 Street that shows the bicycle route continues along the intersecting street, but no “bike box”. At all three of these sites, there is a “No Left Turn” sign which is somewhat in conflict with the other roadway features that aid or direct a cyclist to make a left turn. Clearing up some of this confusion would be a suitable change.

While the city has previously conducted education campaigns on usage of bike boxes, familiarity with this type of facility is likely low (as observed during site visits). Signage to instruct cyclists on the proper use of bike boxes is not present at every installation. During site visits, a wide range of travel behaviours were observed for people attempting left turns from the bicycle lanes, further supporting this confusion.

Pedestrians have been provided with a typical installation, with crosswalks at every intersection and every approach. Based on site observations, sidewalks are generally of adequate size, however the pedestrian right-of-way at the 102 Street stop is highly constrained due to all the road-side infrastructure for transit shelters, ticketing booths, overhead signage supports and architectural features of the adjacent building.

4.1.1 Current and Past Traffic Conditions

This section of the report discusses how typical volumes of traffic have changed along 102 Avenue.

The way that Edmontonian has been heavily altered by the COVID-19 pandemic, which occurred concurrently with the construction along 102 Avenue. According to Statistics Canada, Alberta saw a reduction in car commuting trips of around one-in-ten trips (13.7%) in 2021, compared to 2016 and the number of Albertans commuting by transit fell by more than one-half (54.6%) in 2021, compared to 2016.[1]

The charts and figures provided here are representative of typical traffic counts when comparing the before LRT construction period (before 2019) and the after construction period (2024).

Three separate counting periods were used to assess changes in typical traffic:

- Traffic counts for the *"before"* period were gathered from historical City of Edmonton traffic count websites, available to the public.[2] For each of the study intersections, the most recent data (prior to 2019) was used.

As part of this project, traffic counts were obtained in both 2023 and 2024.

- The 2023 period coincides with substantial completion of construction along 102 Avenue, however LRT operations had not commenced. Traffic counts were collected by City of Edmonton staff for a "typical weekday", on June 27th, for a 24 hour period. Staff used existing equipment and supplied ISL with counts grouped into 15-minute intervals and separated by user groups (Lights, Articulated Trucks, Buses, Pedestrians, Bicycles in Crosswalks and Bicycles on the Road)[3].
- The 2024 period represents a full *"after"* or *"return to a new normal"* situation with the Valley Line LRT in regular service and no major traffic disruptions along the corridor. Traffic counts were collected by City of Edmonton staff for a "typical weekday" on June 25, 2024. Staff used existing equipment and supplied ISL with counts grouped into 60-minute intervals and separated by user groups (Lights, Articulated Trucks, Buses, Pedestrians, Bicycles in Crosswalks and Bicycles on the Road)

Figure 4.2: below shows the overall change in travel behaviour throughout the study site. Each grouping represents a single study intersection, with each bar depicting the total daily number of road users, at that intersection, in the Before (2019), Soft Open (2023), and Full Open (2024) periods. This figure shows that, total number of people along 102 Avenue has decreased at all sites, while 100 Street had the smallest decrease.

[1] https://www150.statcan.gc.ca/n1/daily-quotidien/221130/dq221130c-eng.htm
[2] https://www.edmonton.ca/transportation/traffic_reports/traffic-volumes-turning-movements
[3] From previous experience with the same equipment provider, e-scooters and other micro-mobility devices are grouped in with Bicycles.

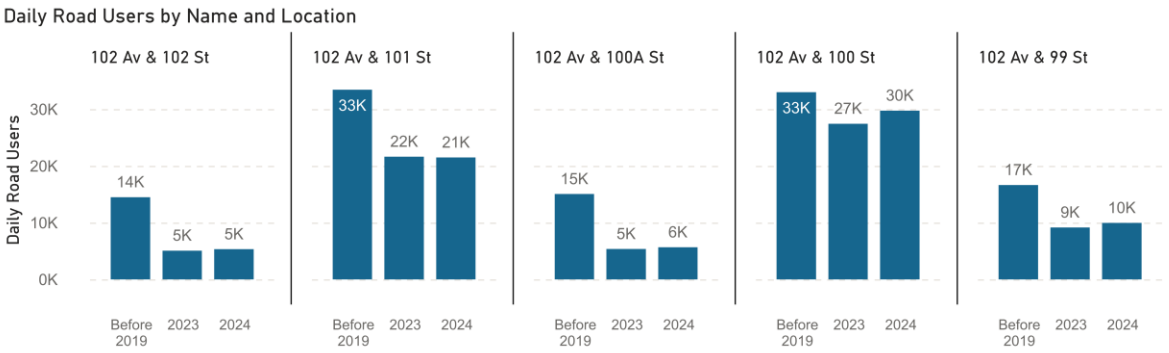


Figure 4.2: Changes to the total number of daily road users

For a further breakdown of the number of people using 102 Avenue, and what modes of travel they are using, the following data pages describe the conditions at each intersection individually.

102 Avenue and 99 Street

Cars and other Motorists

Light Rail Transit

All Modes

People Walking

Bicycles

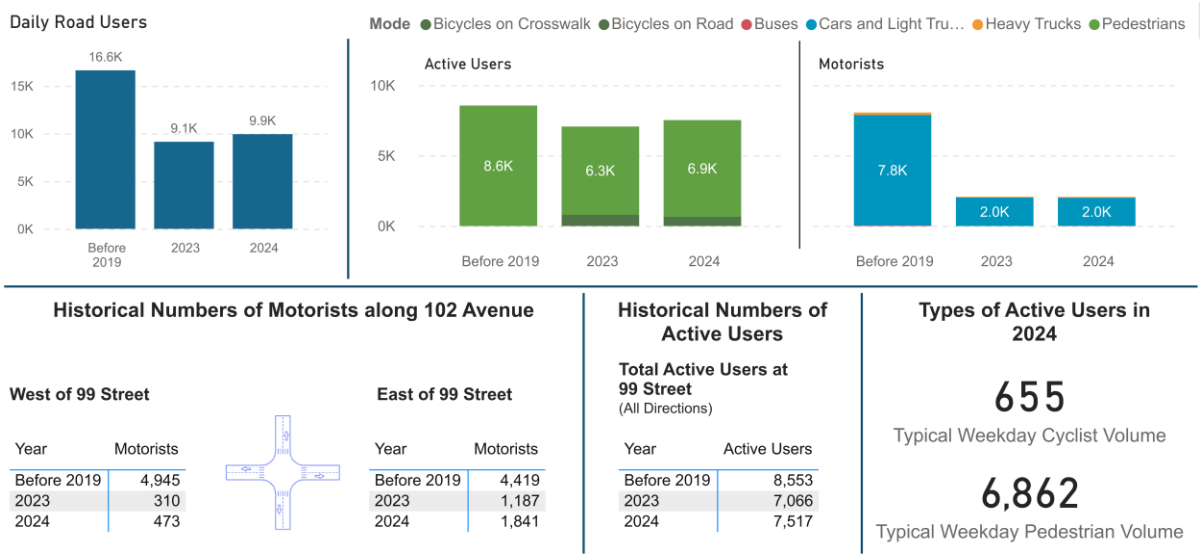
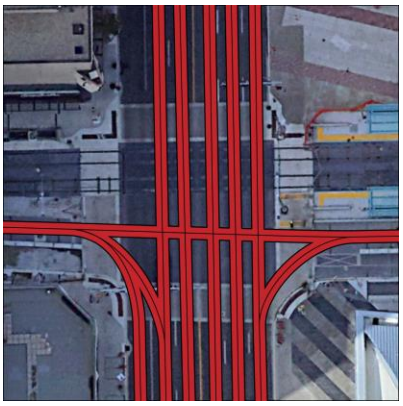


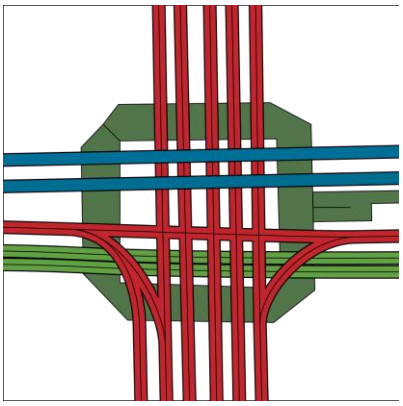
Figure 4.3: Space allocated to each type of road user, at 102 Avenue and 99 Street

102 Avenue and 100 Street



Cars and other Motorists

Light Rail Transit



All Modes

People Walking

Bicycles

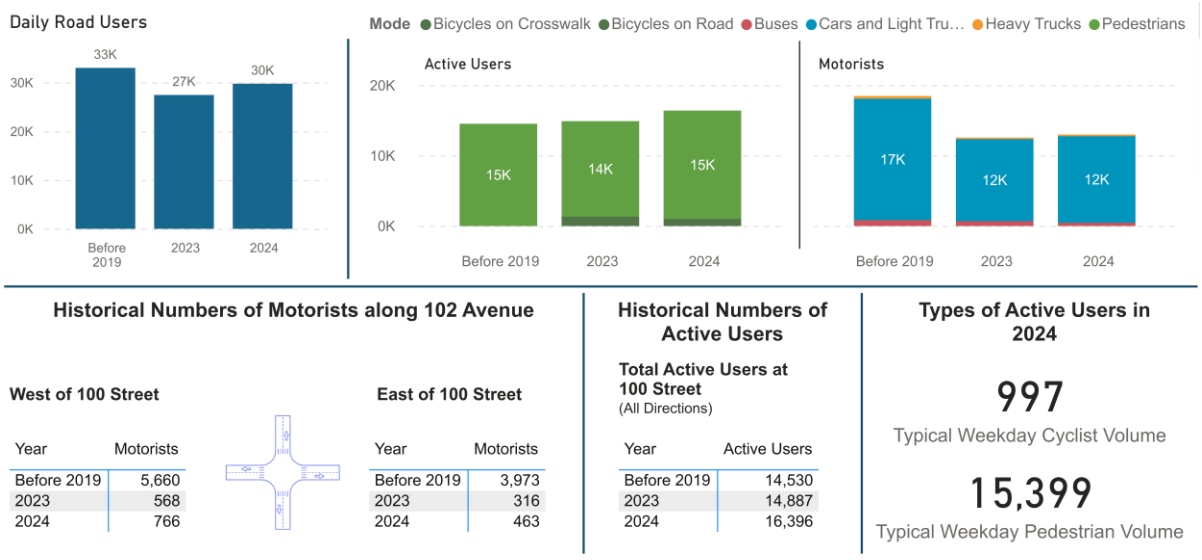
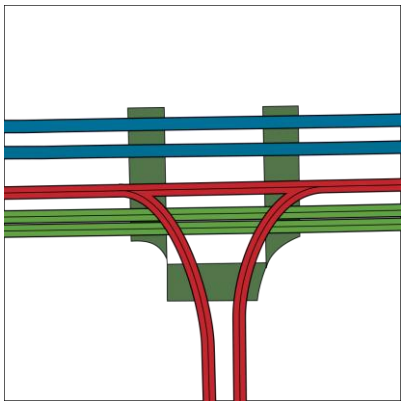


Figure 4.4: Space allocated to each type of road user, at 102 Avenue and 100 Street

102 Avenue and 100A Street

Cars and other Motorists

Light Rail Transit



All Modes

People Walking

Bicycles

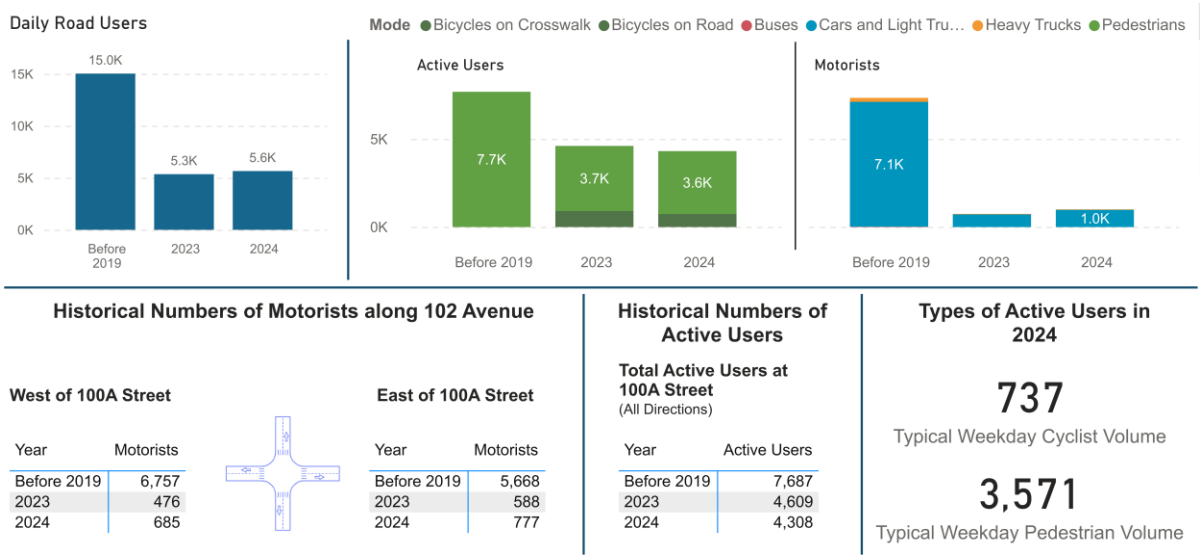
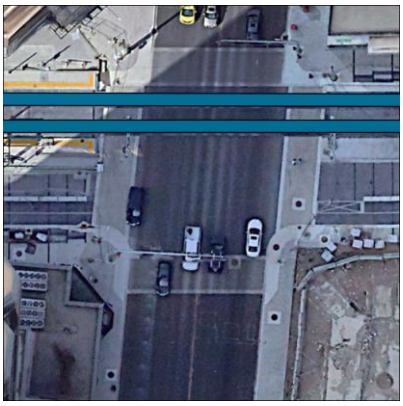


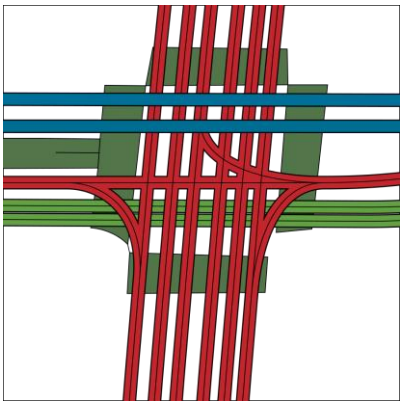
Figure 4.5: Space allocated to each type of road user, at 102 Avenue and 100A Street

102 Avenue and 101 Street

Cars and other Motorists



Light Rail Transit



All Modes

People Walking

Bicycles

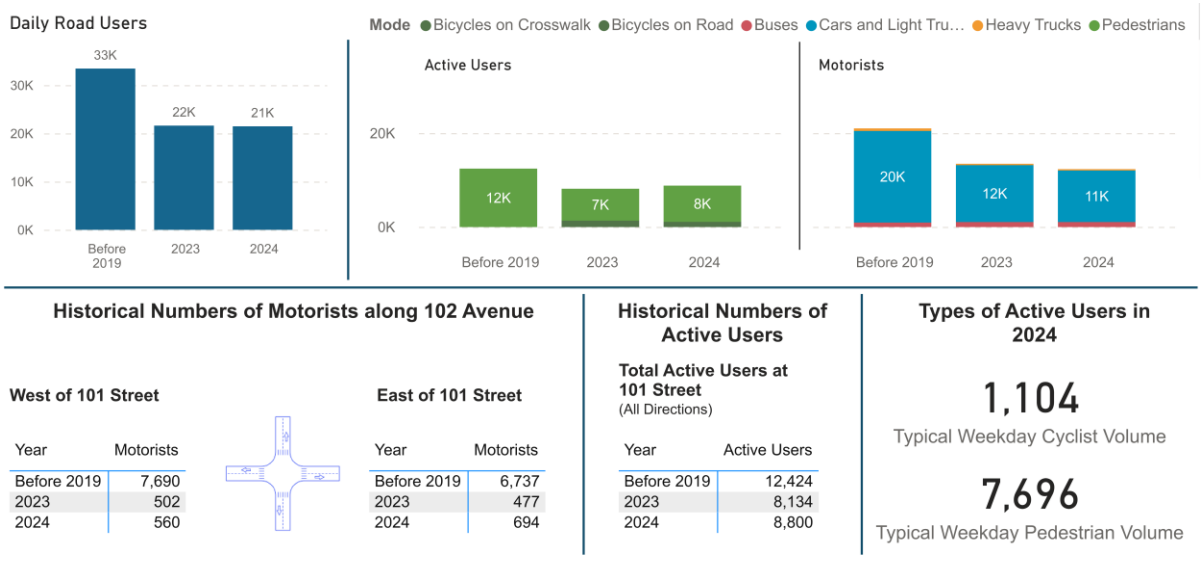
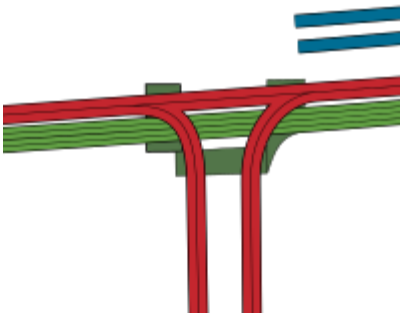


Figure 4.6: Space allocated to each type of road user, at 102 Avenue and 101 Street

102 Avenue and 102 Street

Cars and other Motorists

Light Rail Transit



All Modes

People Walking

Bicycles

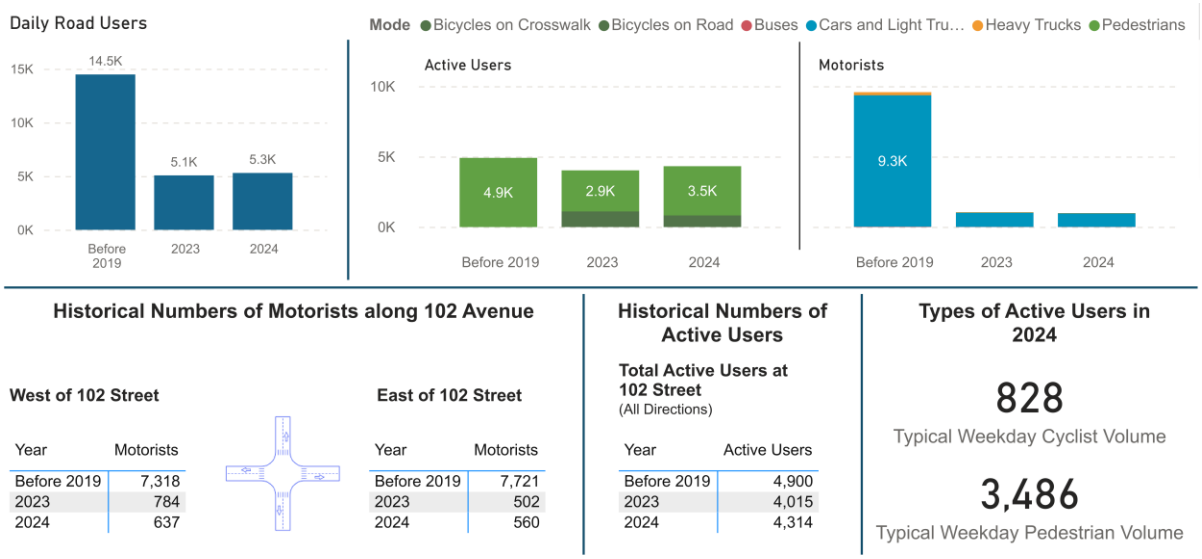


Figure 4.7: Space allocated to each type of road user, at 102 Avenue and 102 Street

4.2 Winter City

The City of Edmonton has adopted a WinterCity strategy, with the aims of embracing and celebrating its northern climate and to encourage people to make use of public spaces during the darkest and coldest times of the year. In 2013, the WinterCity Design Guidelines were published. Contained within are strategic goals to promote Winter Life, Winter Design, Winter Economy and Winter Stories. One of the goals is to “improve winter transportation for pedestrians, cyclists and public transit users”. The 102 Avenue corridor can play a key role in fulfilling the WinterCity objectives, as it has spaced designed specifically for the travel needs of each of those three groups.

During the winter season, the presence of snow changes the way that people, particularly drivers, see the roadway. Lane markings, elevation changes and pavement surface changes are some of the design features within the corridor that are meant to direct road users where they are intended to go. During a fresh snowfall, these features lack clarity and people can become confused. There is some occasional signage to supplement these surface features, however if a driver does not detect this sign, they have few other signals for where they are supposed to go.

Within the City’s snow and ice control program, the bicycle lane is assigned Priority 1 (cleared within 24 hours) while the roadway is assigned Priority 2 (cleared within 5 days).

There have been many reports (by the project team during site visits and members of the public in online spaces) of cars driving in the bicycle lanes, particularly after a fresh snowfall. Motorists are usually expecting to follow the right-side curb, When the road design relies on surface features to communicate the proper space for motor vehicles, if those features are not easily detected then the design intent does not get relayed to the driver.

With the opening of the Valley Line LRT in November 2023, many people’s first exposure to the fully operational 102 Avenue was during the winter months. Many of the design features along the corridor rely on surface materials and paint markings, which are of limited usefulness immediately after a fresh snowfall. Informal site visits were conducted during the winter months, however the detailed near miss analysis was not prepared in time for an assessment during the winter season.

Views along 102 Avenue after a fresh snowfall

5.0 Safety Analysis

The focus of this report is to examine the behaviours and safety outcomes that result from what has been built. This includes examining the collision history of the corridor and conducting a near miss analysis by observing behaviours of people using the public space.

The safety analysis has been split into 3 sub-sections:

1. **Collision History**
   Examining the number of collisions, the proportionate collision rate and location of collisions along the 102 Avenue Corridor.

2. **Direct Observation Near Miss Analysis**
   Observe and record travel behaviours of road users along the corridor, by recording near miss incidents and unsafe acts. This analysis was completed only for the peak periods when vulnerable road users (people walking, cycling or other non-vehicular mechanism) are present.

3. **Computer-Aided Near Miss Analysis**
   Leverage video-capture and computer-vision related technologies to record road user trajectories and near miss incidents for a full 24-hour period.

OVERVIEW OF TRAFFIC SAFETY ASESSMENTS

A strict definition of safety is the *absence* of risk or danger, with situations that are safer being inherently less risky. Regarding traffic safety, the degree of acceptable risk will be different across individuals, governments, professions and demographics. An agreeable goal is that the public space should permit people to freely move without serious injury or death. This is the basis of the Vision Zero movement with the City of Edmonton's Safe Mobility Strategy aiming for zero traffic-related serious injuries and fatalities by 2032.

As stated within the Safe Mobility Strategy for 2021-2025, crash numbers that are primarily derived from police reports don't provide the full picture. Incidents that don't involve a motor vehicle will be under-reported using this mechanism. However, this is the primary source of data available for analyzing the first 6 months the Valley Line LRT has started operating. To supplement this data source, this study has completed a near miss analysis (through site observations) and gathered safety-related reports collected by the operators of the Valley Line LRT.

5.1 Reporting of Collision Incidents

Collision incidents have been reviewed and analyzed based on frequency (total number of collisions) and rates (collisions per vehicle). Collision rates are used when the volume of traffic differs between sites and time frames by factoring in the risk exposure to the number of collisions.

To aid in comparing current conditions against previous conditions, this safety analysis has split the history of 102 Avenue into three time periods:

- **Before LRT Construction:** January 2015 through December 2017[4] (36 months)
- **Soft Opening:** Between July 2022 through October 2023 (15 months)
  - Corresponding with partial opening of 102 Avenue to traffic, but the LRT remains closed to the public
- **Full Opening:** November 2023 through June 2024 (8 months)
  - Corresponding with full opening of Valley Line LRT operations to regularly scheduled service

The time between December 2017 and July 2022 (when construction along 102 Avenue was ongoing) has been discarded from this analysis, as freedom of movement was heavily impacted and is outside the purpose of assessing the current operations of the corridor.

Collision reports have been obtained from two main resources:

- City Administration (Parks and Road Services) via Edmonton Police Services (EPS) reports
- TransEd operations

The conditions for reporting and data collection for both of these services are unique to those organizations are likely different from each other. This would result in somewhat different numbers of collisions. For example, collision reports derived from EPS field reports are slightly biased towards vehicle-involved collisions as there are legal reporting requirements and private insurance requirements for drivers. A pedestrian-only or a bicycle-pedestrian collision is unlikely to be reported, even if some element of property damage or minor injury occurs. TransEd is focused on maintaining operations and any incident which results in a service interruption was been captured in their metrics.

Furthermore, the transition towards Collision Reporting Centres run by Accident Support Services International (ASSI) have impacted the timeliness of collision events reported to City Administration. As such, for the time period under full LRT operations, property-damage-only crashes are under reported within 2024; any major injury or fatality related collisions in 2024 would have been processed and included in this analysis (of which there were none). This compromise was made to ensure delivery of this safety assessment within the timelines requested by City Council.

Lastly, this report has not analyzed collision data while the 102 Avenue corridor was fully closed to vehicular traffic. Only the time periods described above have been assessed.

5.1.1 City's Internally Collected Collision Data

Collisions reported to the City of Edmonton, and monitored by the Safe Mobility Team (across all three analysis periods) are presented here. Figure 5.1 shows the total number of collisions with the centre of each pie-chart representing the location of the event and the size of the bubble matching the number of events. The wedges within each pie-chart show the percentage of events that match the before, soft open, and full open time periods. Note: these percentages have not been normalized for the duration of time periods (where before represents 3 years of data and the full open includes only 8 months) and have not been normalized for volume of traffic and time.

[4] Utility relocate construction commenced in 2016 and 2017 with 102 Avenue partially open to traffic at various times. City administration supplied collision data for the "before period" between 2015 and 2017.

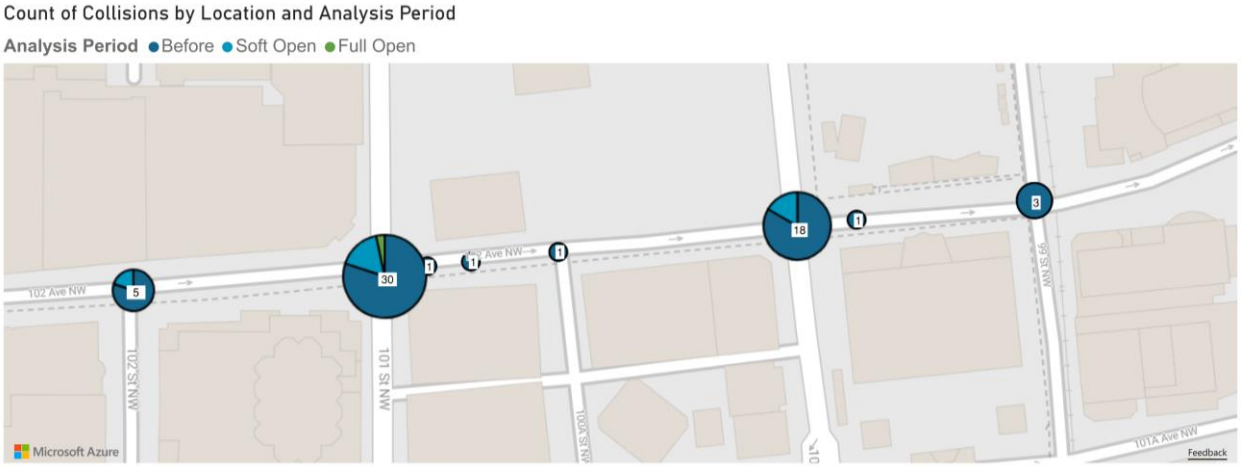
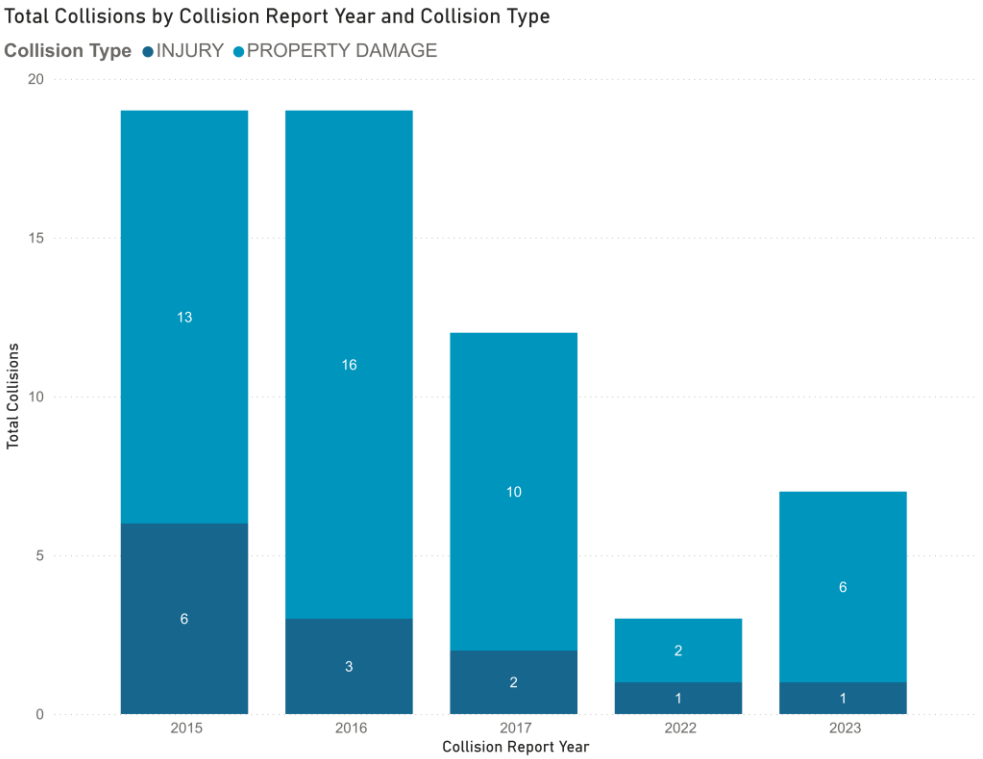


Figure 5.1: Locations of all reported collisions

The figure above shows that the majority of events have occurred at 100 Street and 101 Street, and correlates with the expected higher number of vehicles and road users at these locations.

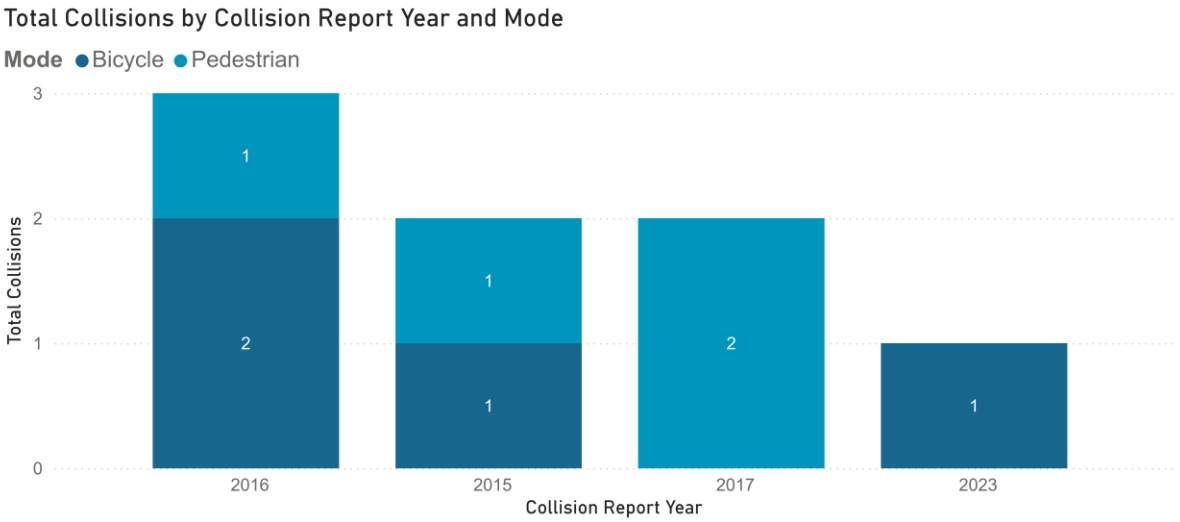
Examining the number of collisions over time, Figure 5.2 shows the year of each reported event, as well as the severity type of the event (either injury-related or property-damage only).



The years between 2018 and 2021 are outside the scope of this report. The 102 Avenue corridor was closed to the public due to construction.

Figure 5.2: Collisions by Year and Severity

This figure illustrates an initial decline in total number of collisions following the completion of construction along the corridor. It is important to consider this decrease within the greater context of changes in traffic volumes and travel behaviour, as brought-on by both the corridor redesign and the broader societal shifts post COVID-19 pandemic.



The years between 2018 and 2021 are outside the scope of this report. The 102 Avenue corridor was closed to the public due to construction. There were no active mode collisions in 2022.

Figure 5.3: Active Mode Related Collisions by Year

The figure above shows the number of reported collisions related to active modes of travel (pedestrian or cyclist). All of these reported collisions involved some form of injury.

A detailed breakdown of this data is presented in Figure 5.4, which shows the total number of collisions at key locations along the corridor. Due to the timelines required for city staff to process city-wide collision data, property-damage only collisions were only available for the first 3 months of the Full Open period (injury-related collisions were processed for the full 6 months, however there were no injury-related collisions within the study area). The sole reported collision within the Full Open period was a property damage event, in December 2023, resulting from an improper lane change at 102 Avenue and 101 Street.

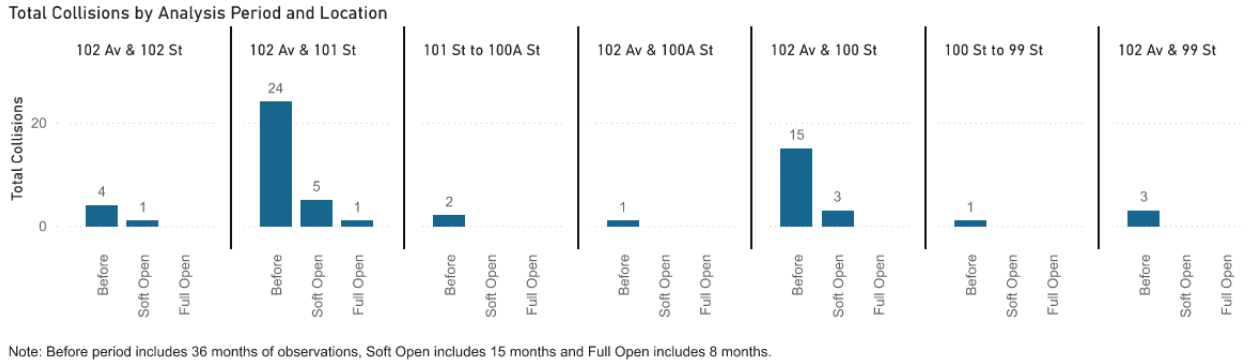


Figure 5.4: Total Collisions for each study location and in each analysis period

Proportionate Collision Rates

As explained previously, using the total number of collisions introduces bias due to the short duration of the after period (since the LRT has not yet been operational for a full year) and the changes in traffic volumes between time periods. Figure 5.5 addresses this bias by dividing the collisions at each location by the typical daily volume of traffic entering the intersection. This figure also includes some "sensitivity" error bars, which depict the range of crash rates that would result *as if* one more or one fewer collision occurred in each time period.

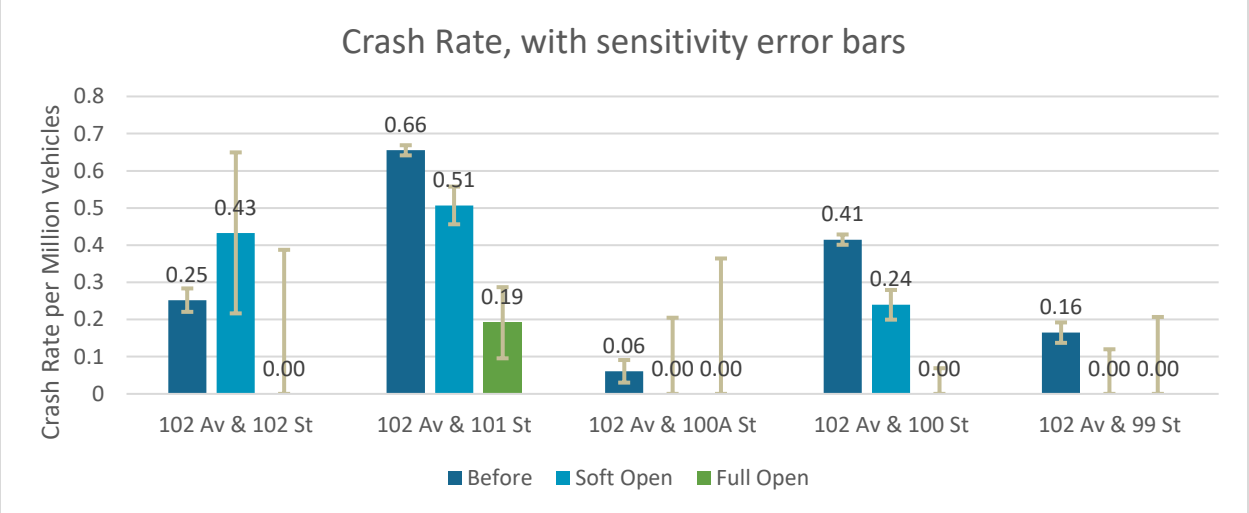


Figure 5.5: Intersection Crash Rate (per million vehicles) in each analysis period

The limited amount of data does not permit many solid conclusive statements, due to the short time period. For example, if one additional collision had occurred within the 6-month of full LRT operations, each of the minor street locations would result in similar or higher collision rates than in the before period. In contrast, should the number of collisions at these sites remain zero for an extended period, this would provide more confidence that the collision risk has truly decreased and is not simply a result of the random nature of when collisions occur.

The lower volume sites (102 Street, 100A Street and 99 Street) have not had sufficient time to conclusively state that collision rates have reduced. The busiest intersections (101 Street and 100 Street) demonstrate a pattern of reducing the number of collisions and reducing collision rates. This matches expectations that, by reducing the amount of conflicting traffic (along 102 Avenue), there are fewer chances for collisions along the high volume streets.

The data does not provide any conclusions regarding low severity vehicle-bicycle, or vehicle-pedestrian collisions. Small dents or dings to a vehicles body and possibly some damage to a bicycle or other device would be the likely outcome of these low-severity events. These types of events typically don't reported to collision reporting centres, unless one person involved sought compensation from personal insurance. Even minor injuries to cyclists and pedestrians would go under-reported unless the vulnerable person sought medical attention, and gathering medical information was not made available.

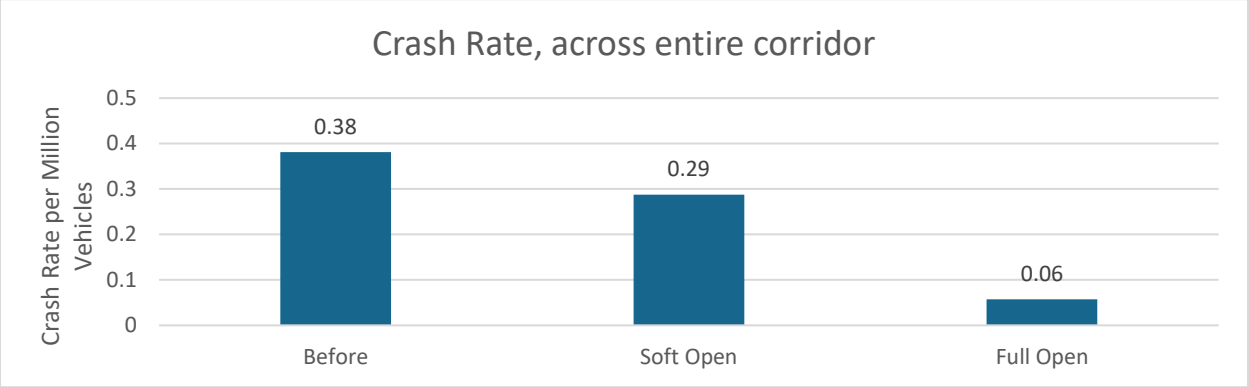


Figure 5.6: Crash Rate for the entire 102 Avenue corridor in all three analysis periods

While the full data for 2024 is not yet available, the information made available shows that the absolute risk and chance of collisions has decreased, mainly due to the decrease in the number of cars using 102 Avenue.

5.1.2 Valley Line LRT

TransEd collects data of safety incidents that are reported to the Valley Line LRT operation control center from LRT drivers. This data is subsequently reported to the City of Edmonton through an ongoing reporting tool.

A Near Miss for TransEd is described as an event (as reported by a LRT driver or other TransEd worker) that could have caused damage, injury, or death but was avoided. A collision is a reported incident where an LRT vehicle struck a person or vehicle.

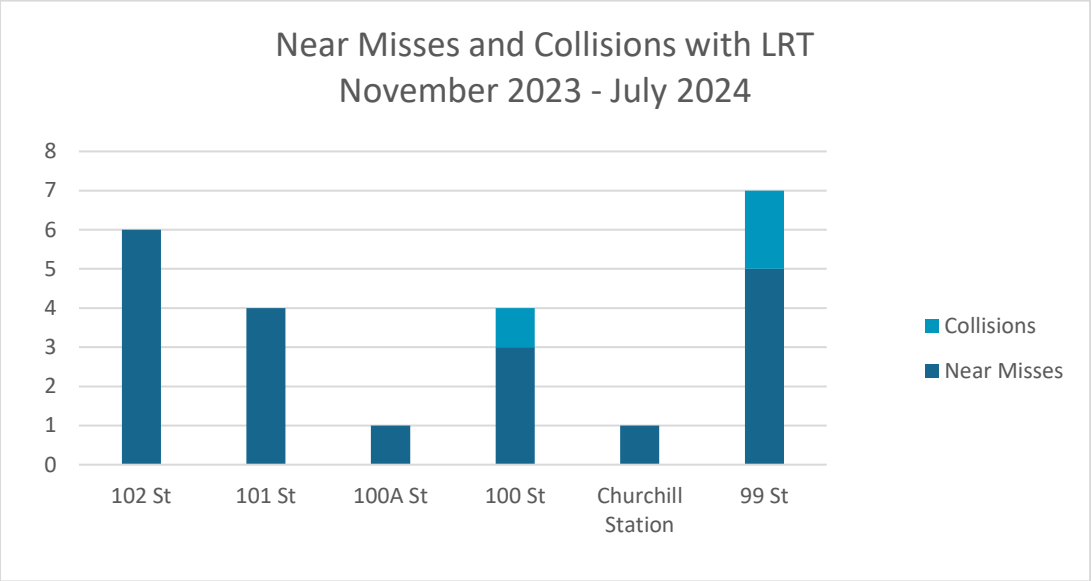


Figure 5.7: Near Misses and Collisions with LRT along 102 Avenue – November 2023 through July 2024

Figure 5.7 shows the number of near misses and collision events reported by TransEd for the Full Opening period (November 2023 through July 2024). This chart demonstrates that the intersections with 102 Street and 99 Street are the most prominent locations for LRT-related events. Table 5.1 and Figure 5.8 provide a breakdown of where and what type of events occurred as well as how they have changed over time.

Table 5.1: Incidents related to the Valley Line LRT – November 2023 through July 2024

Location	Near Misses	Collisions	Total Events	Equivalent # of Events per Year
102 St	6	0	6	**12**
101 St	4	0	4	**8**
100A St	1	0	1	**2**
100 St	3	1	4	**8**
Churchill Station	1	0	1	**2**
99 St	5	2	7	**14**
Total	**20**	**3**	**23**	

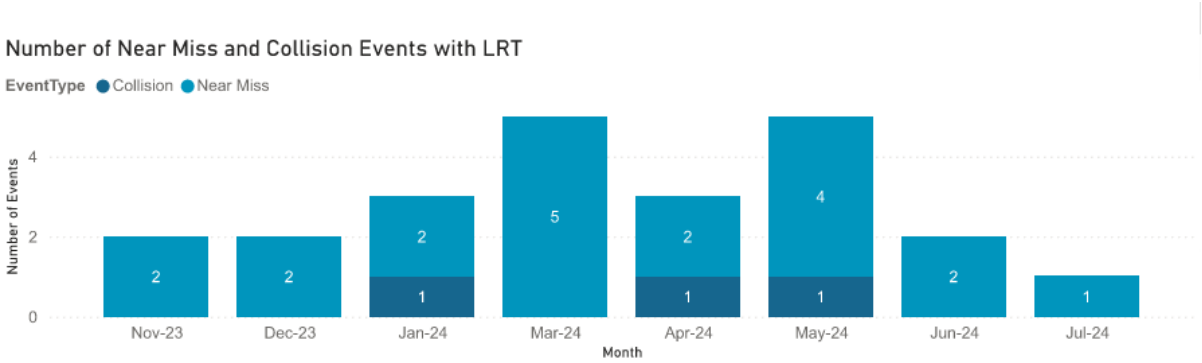


Figure 5.8: Time of year for reported near miss and collision events with LRT vehicles.

Of the three reported collisions with Light-Rail Transit vehicles within the study area, two involved a pedestrian and one involved a motorist. Unfortunately, the data source supplied does not include follow-up information for a standard categorizing of the severity of these events.[5] Of the near misses within the study period, 9 events were pedestrian-related, 10 were vehicle-related and 1 was cyclist-related. One of the motorist-related events was due to a police vehicle, with emergency lights activated, crossing the path of the Light-Rail Vehicle.

[5] The single motor-vehicle collision reports that no injuries occurred to the motorist or any persons on the LRV. The two pedestrian-related events state that EMS was dispatched, with no further information.

5.2 Near Miss Analysis – Direct Observations

As a means of assessing the number of near miss events along the 102 Avenue corridor, the project team completed a series of site visits. To quantify the amount of near miss and other traffic violations, a team of 5 inspectors spread across the entire corridor recorded and tracked the number of near miss and unsafe acts, primarily focused on vulnerable road users.

In addition to the 5 study areas along 102 Avenue, an alternative site within the downtown site was visited to be used as a comparison, as a control site.

5.2.1 Outline

At each study site, inspectors were stationed and tasked with recording any collisions, near misses, or unsafe act / violation within their zone. They were to record the type of road users involved in the event, and the location where it occurred.

Since vulnerable road users (ie, not within a motor vehicle or transit vehicle) were a main concern from the public and the project team, the 2 study inspection visits were aimed at times when pedestrian and cycling volumes are known to be at their highest. Three time periods were used:

- Weekday Lunch Hour 12:00 pm to 1:00 pm
- Weekday PM Early Rush Hour 3:30 pm to 4:30 pm
- Weekday PM Late Rush Hour 4:30 pm to 5:30 pm

This resulted in a total of 15 hours of direct observation (3 hours x 5 sites). The site visits occurred on Tuesday, May 14th, during the lunch hour, and Wednesday, May 29th, during the evening rush hours. Both days had pleasant weather, with temperatures of between 20°C and 24°C and slightly cloudy skies.

Events were recorded as either collisions, near miss events, or unsafe acts, defined as follows:

- Collision – Physical collision between road users, as a result of an improper movement.
- Near Miss – An event where a collision might have occurred, were it not for evasive action on the part of one or more road users, for example swerving or slowing/braking to avoid a collision.
- Non-Compliance – A road user opting to violate a traffic rule, but no other road user was impacted by this decision.

With the extremely high number of interactions at these intersections during peak time periods, focus was placed on how vulnerable road users used the public space. Minor violations by motorists (eg. stopping legally and then slowly creeping forward during a right-turn) were not recorded *unless* it resulted in a noticeable near-miss event involving a cyclist or pedestrian needing to avoid the motorist.

The corridor was broken into 5 analysis sites (Figure 5.9), with one observer responsible for recording all events within their zone. The study sites were:

1. 102 Avenue between 102 Street to 101 Street
2. 102 Avenue at 101 Street
3. 102 Avenue between 101 Street and 100 Street
4. 102 Avenue at 100 Street
5. 102 Avenue between 100 Street and 99 Street

The comparison site was the intersection of 102 Avenue and 104 Street. This site provided a reasonable contrast as a two-way bicycle lane is also present, large numbers of pedestrians are known to use the area and 104 Street provides a secondary north-south route for motorists within the downtown core. A key difference is that this site did not have an LRT alignment present (but is planned for in future expansions).

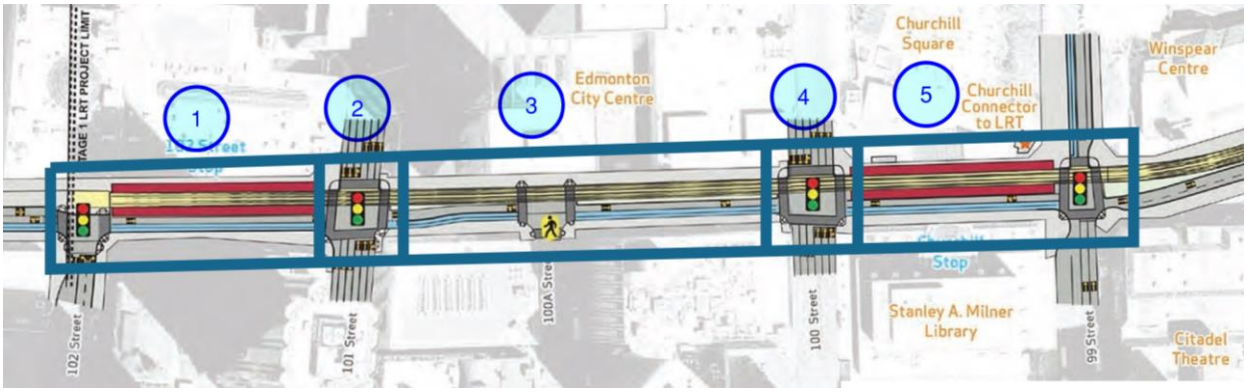


Figure 5.9: 5 Study areas used for recording near misses and other unsafe acts (Background from Stage 1 Booklet, September 2016)

5.2.2 Results

This section details the observations that were recorded upon 2 separate site visits to the 102 Avenue Corridor.

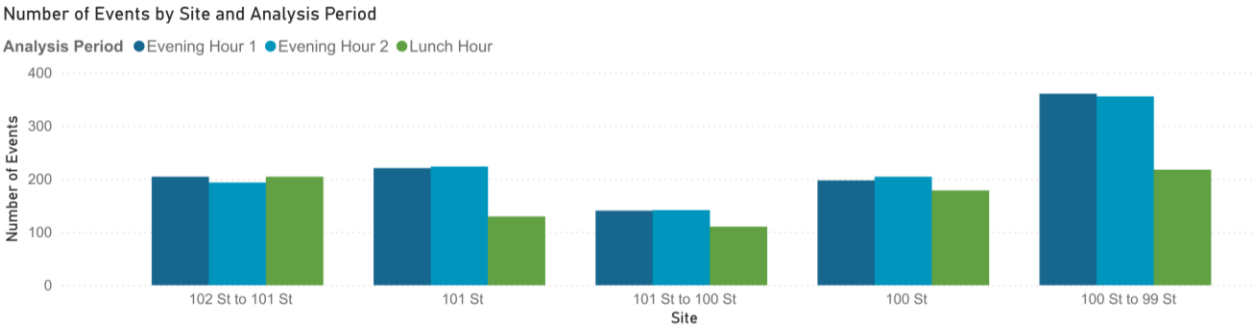


Figure 5.10: Total Number of Incidents across all study sites and observation periods

Across all 3 observation periods, a total of 50 Near Miss events and 3025 Unsafe Acts were recorded. This results in a ratio of 60-to-1 for Unsafe Acts to Near Misses. No collisions were recorded.

Regarding Near Misses, Table 5.2 shows the total number of near miss events for each observation period and each observation site.

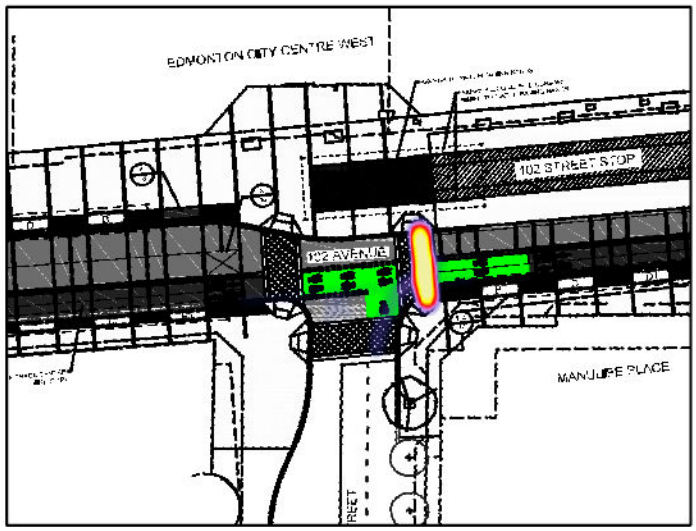
Table 5.2: Number of Near Misses Recorded during the direct observation site visits.

Row Labels	102 St to 101 St	101 St	101 St to 100 St	100 St	100 St to 99 St	Total
Evening Hour 1	1	6	3	4	11	25
Evening Hour 2	4	1	1	5	3	14
Lunch Hour	1	3	2	5		11
Total	**6**	**10**	**6**	**14**	**14**	**50**

As part of recording near miss events, the trajectory or travel path of the road users was recorded. This data was used to give clearer detail on where within each intersection that unsafe acts are most prominent. The following pages provide heatmaps for the total number of events during each observation period, with subset figures for each study area. Cool colours, such as purple and blue, demonstrate a low number of events, while hotter colours (red, orange, yellow and white) show increasing numbers of near miss and unsafe acts.

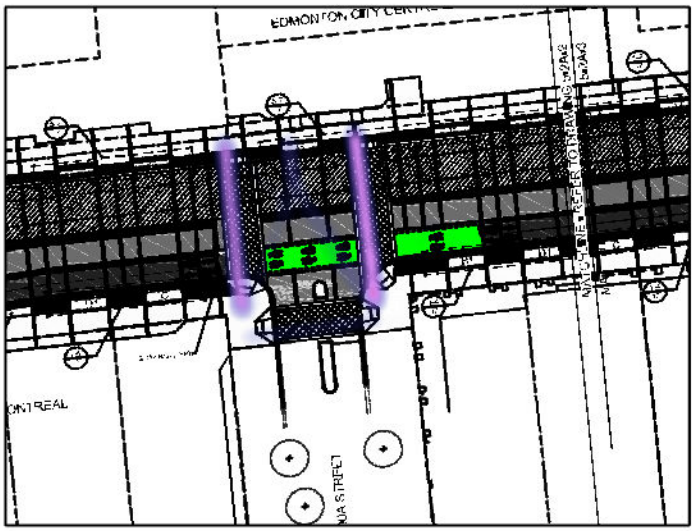
One observable pattern is that hotter locations match up with crosswalk connecting to LRT stations. At these places, many people are traveling to and from the station and are often urgently attempting to catch the next departing vehicle. Also, at these crosswalks, there is a very low number of conflicting motorists (see Section 4.2) and so the perception is that the risk of colliding with another vehicle is quite low.

102 STREET AND 102 AVENUE



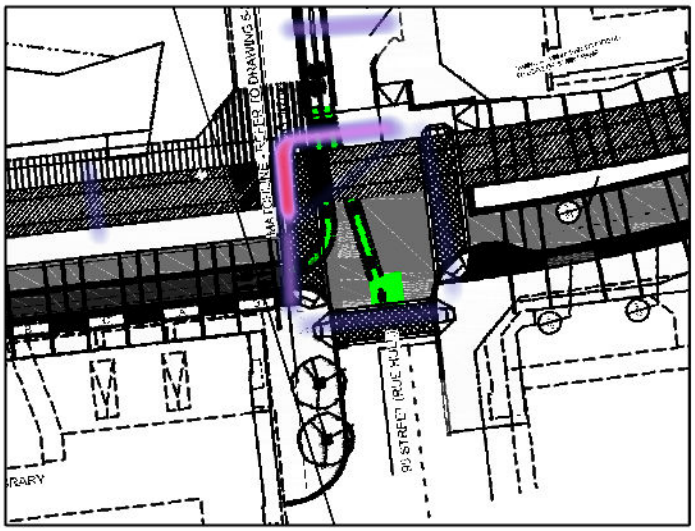
101 STREET AND 102 AVENUE

100A STREET AND 102 AVENUE



100 STREET AND 102 AVENUE

99 STREET AND 102 AVENUE



LEGEND

Value

High

Low

TITLE

HEATMAP OF RIGHT-OF-WAY VIOLATIONS LUNCH HOUR

PROJECT

102 AVENUE ASSESSMENT

CLIENT

CITY OF EDMONTON

PROJECTION

NAD 1983 3TM 114

DATA SOURCES

- Topographic Map: Valley LRT Line - 102 Avenue Streetscape Drawings

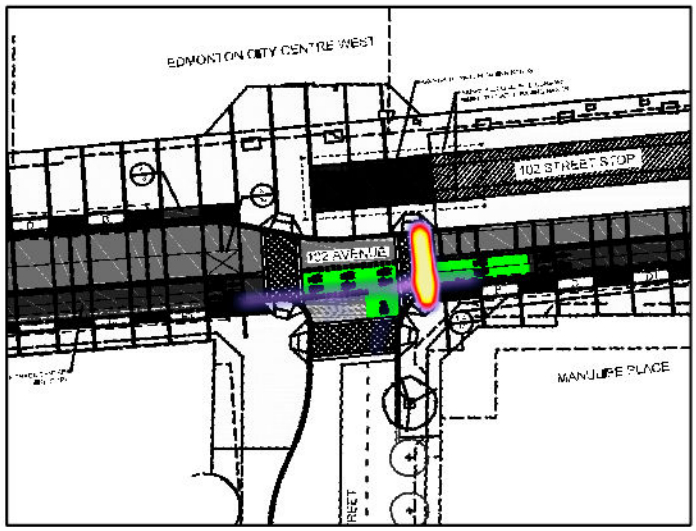
0 10 20

1:1,000 Meters

FIGURE	5.11
DATE	2024-10-16
PROJECT NO.	16649
AUTHOR	dmason

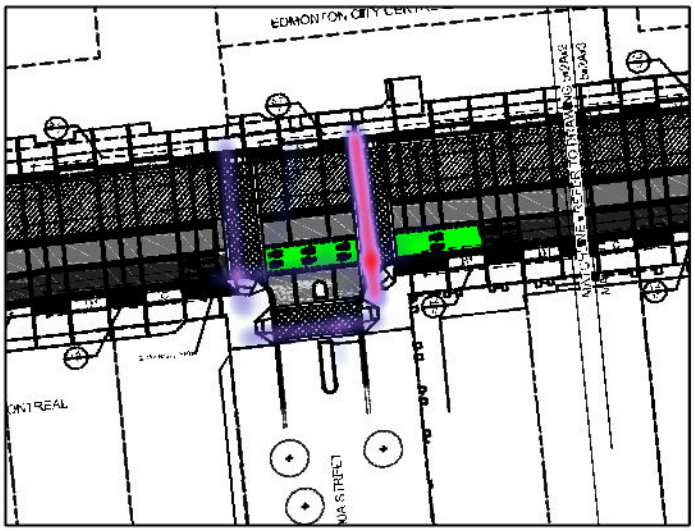
Document Z:\Shared\GIS\Projects\16649_102 Avenue Evaluation\16649_GISProject\16649_GISProject.aprx - 5.11_figure_85x11_mosaic_layout

102 STREET AND 102 AVENUE



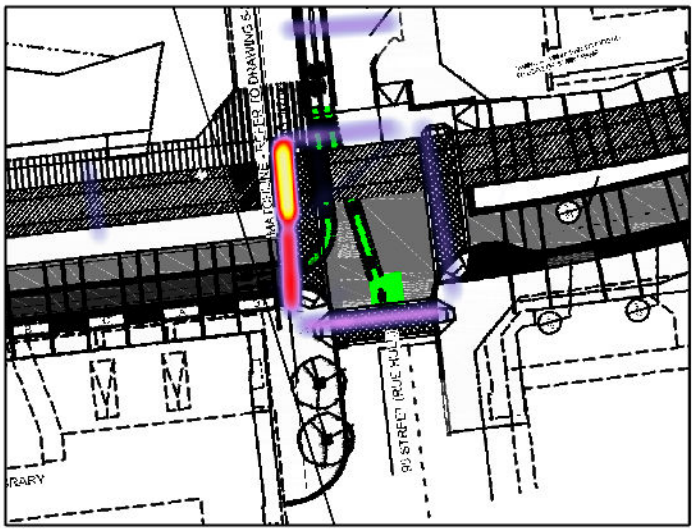
101 STREET AND 102 AVENUE

100A STREET AND 102 AVENUE



100 STREET AND 102 AVENUE

99 STREET AND 102 AVENUE



LEGEND

Value

High

Low

TITLE

HEATMAP OF RIGHT-OF-WAY VIOLATIONS
EARLY PM RUSH HOUR

PROJECT

102 AVENUE ASSESSMENT

CLIENT

CITY OF EDMONTON

PROJECTION

NAD 1983 3TM 114

DATA SOURCES

- Topographic Map: Valley LRT Line - 102 Avenue Streetscape Drawings

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FIGURE	5.12
DATE	2024-10-16
PROJECT NO.	16649
AUTHOR	dmason

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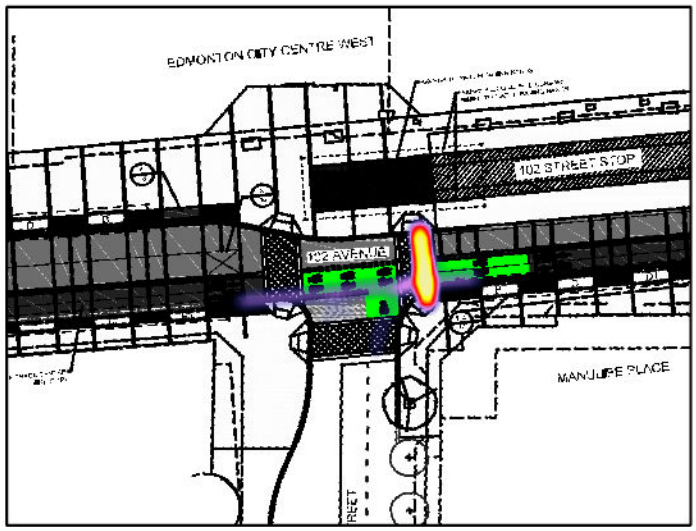
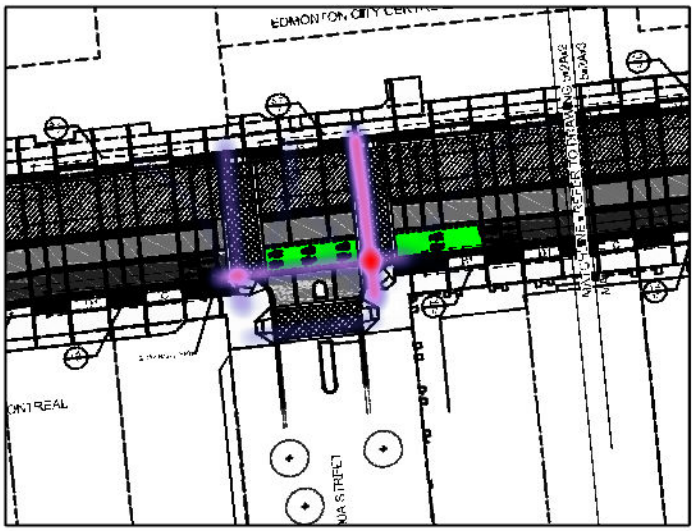
102 STREET AND 102 AVENUE



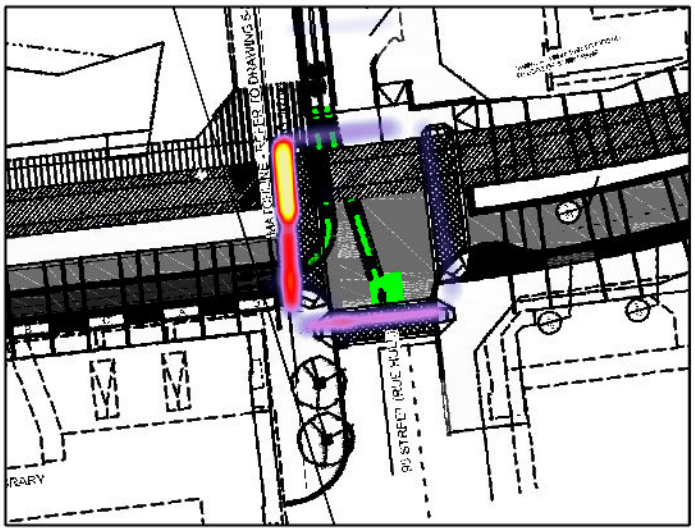
101 STREET AND 102 AVENUE

100A STREET AND 102 AVENUE



100 STREET AND 102 AVENUE

99 STREET AND 102 AVENUE



LEGEND

Value

High

Low

TITLE

HEATMAP OF RIGHT-OF-WAY VIOLATIONS
LATE PM RUSH HOUR

PROJECT

102 AVENUE ASSESSMENT

CLIENT

CITY OF EDMONTON

PROJECTION

NAD 1983 3TM 114

DATA SOURCES

- Topographic Map: Valley LRT Line - 102 Avenue Streetscape Drawings

0 10 20

1:1,000 Meters

FIGURE	5.13
DATE	2024-10-16
PROJECT NO.	16649
AUTHOR	dmason

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5.2.3 Analysis

To provide some context to the results presented above, this section provides some high level observations, highlights a handful of notable events and then provides some detail regarding patterns for bicycle- and pedestrian-related observations. From qualitative and descriptive reports from site inspectors, the majority of pedestrian non-compliance behaviours involved checking for oncoming traffic, while the near-miss pedestrian events were from a lack of checking for traffic, or poorly assessing the oncoming traffic.

Amongst all of the near misses, the most often cited reasons for a near miss by site inspectors include the following:

- A person started crossing against Don't Walk and another person (on a bicycle, scooter, or in a car) had to slow down or re-position to avoid a collision.
  - Inspectors remarked that most often cars, bicycles or pedestrians would gradually slow down until the conflict area was cleared, before proceeding undisturbed.[6]
  - Inspectors noted that rarely was a near miss event imminently avoiding a collision (ie. emergency braking or sudden swerving of direction).

Some key noted events:

- Westbound bicycle at 102 Street failed to stop at a red light while a right-turning car had to use emergency braking.
- An Eastbound car proceeded through a red light at 99 Street causing a northbound bicycle to slow down to avoid.
- On several occasions at 100 Street, bicycles in the bicycle tracks had to slow down significantly to avoid pedestrians in the crosswalk (Don't Walk)

Bicycle-Related Incidents

Figure 5.14 shows the non-compliance rate (percentage of cyclists who were involved in at least one moving-violation) for bicycles across the study sites, as well as at the comparison site. The comparison site shows a very low rate for unsafe acts / non-compliance (2% to 10% of people), and this rate somewhat matches the study sites at 100 Street and 101 Street. The non-compliance rate at the secondary streets (102 St, 100A St and 99 St) is much higher.

Near miss and Non-Compliance rates are per 1000 road users. This was selected to provide direct comparison with the video conflict analysis supplier's data.

[6] These event nonetheless are recorded as a Near Miss since a less attentive person that did not slow down would have resulted in a collision.

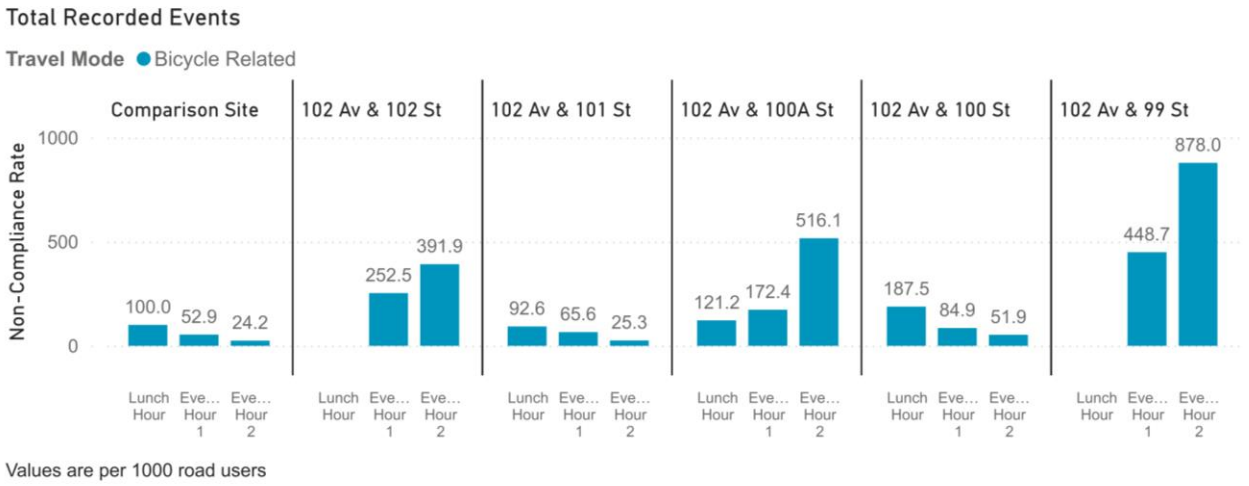

Figure 5.14: Non-Compliance Rate for Bicycle Users

Some observations in the patterns of bicycle non-compliance:

- Non-compliance increases in the second evening hour (4:30 pm to 5:30 pm), specifically near the secondary streets.
  - It is speculated that, as the rush hour for car traffic wanes, there are fewer conflicts for cyclists on already low volume secondary streets. Cyclists are more likely to violate right-of-way when they can observe few, if any, potential conflicts.
- Depending on the site, there was a lower number of cyclist-related events during the Lunch Hour. Most bicycle traffic coincided with daily “Rush Hour” traffic for people commuting to and from work, and so very few cyclist events occurred in the middle of the day.

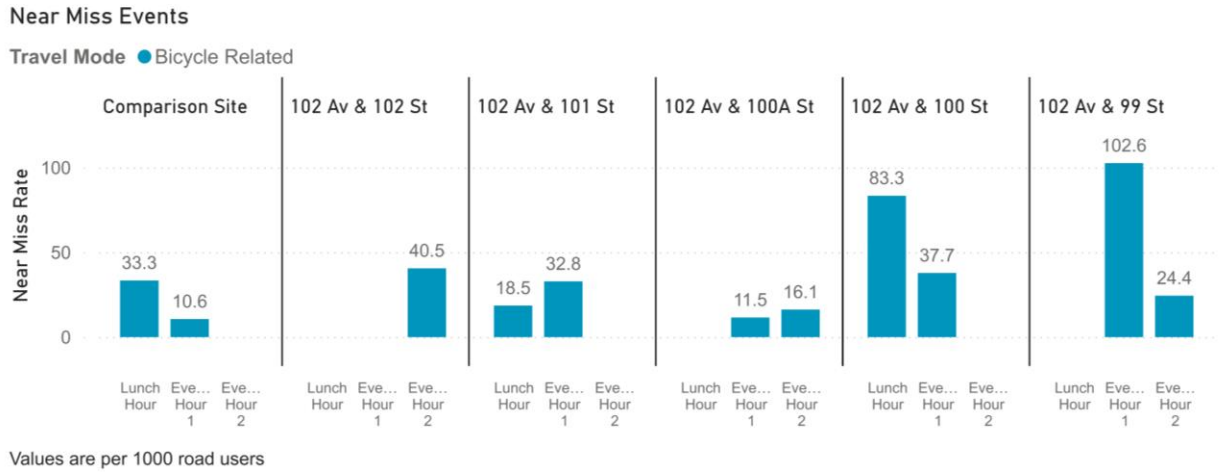

Figure 5.15: Near Miss Rate for Bicycle Users (periods with 0 counts had no near-misses involving cyclists)

Figure 5.15 shows only the “near miss rate” (percentage of users involved in a near miss). Recall that a near miss was identified whenever one or more road users needed an avoidance action, large or small, to prevent a collision; gradually slowing or diverting your path would count as a near miss. Also note, these rates are not “at-fault” rates, thus a near-miss is identified as bicycle related whether the cyclist with the right-of-way was avoiding the collision or whether they were violating right-of-way.

The Near Miss rate is much lower than the total Non-Compliance rate, further supporting the fact that most interactions do not present immediate danger.

- Near Misses with cyclists are highest at 100 Street and at 99 Street, and also higher than at the comparison site.

Pedestrian Related Incidents

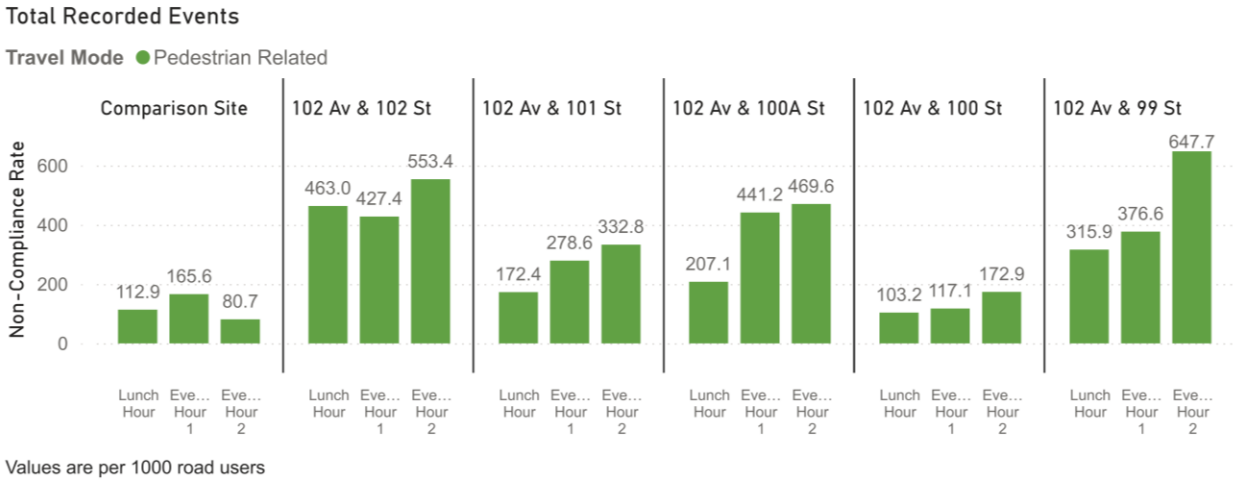

Figure 5.16: Non-Compliance Rate for People Walking

Pedestrian related incidents typically took the form of crossing at a red light or don’t walk signal or crossing outside of a designated crosswalk. Inspectors erred towards lenience when determining if a specific behaviour merited recording as non-compliant. For example, if the Don’t’ Walk signal was displayed moments (<5 seconds) before a pedestrian entered the crosswalk, then this behaviour was not recorded. However, if the pedestrian entered the crosswalk late into the countdown timer for Don’t Walk, then this was recorded as non-compliant.

Figure 5.16 shows the non-compliance rate (proportion of users who were involved in at least one moving-violation) for people walking across the study sites, as well as at the comparison site. The comparison site shows a low rate for unsafe acts (8% to 16.5%). 100 Street somewhat matches the comparison site, however all of the other study intersections have much higher non-compliance (up to 65% of people walking).

Some observations in the patterns for pedestrian non-compliance:

- For many of the events, site inspectors noted the violation was walking within the crosswalk, against a “Don’t Walk” signal.
  - Site inspectors speculated that the higher rate along 102 Avenue is due to extended pedestrian wait times, resulting from the signals at the LRT tracks.

- Pedestrians would often stand waiting for some time while no other vehicles were using the intersection or were permitted to traverse their intended crosswalk. Other pedestrians were familiar with this situation and completed their crossing after checking for oncoming traffic.

- Non-Compliance rate is higher at the sites with less car traffic.
  - In combination with the high wait times, the secondary intersections have fewer conflicts with motorized vehicles.
  - There may be a perception by people walking that they should be afforded a higher degree of mobility and freedom of movement when they are away from the busy arterial streets.

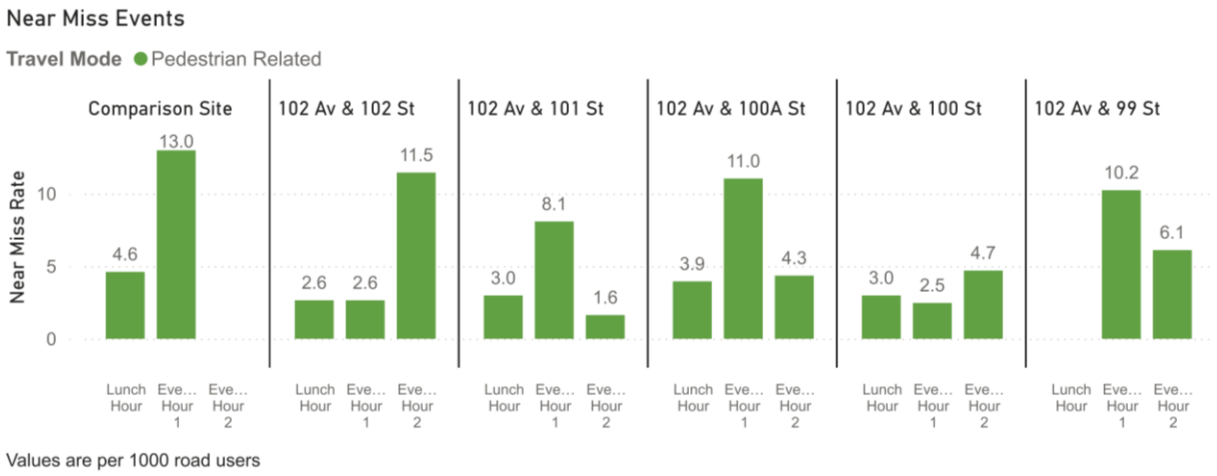

Figure 5.17: Near Miss Rate for People Walking

Figure 5.17 shows only the “near miss rate” (percentage of people walking involved in a near miss). Recall that a near miss was identified whenever one or more road users needed an avoidance action, large or small, to prevent a collision.

The Near Miss rate is much lower than the total Non-Compliance rate, further supporting the fact that most interactions do not present immediate danger.

- The near miss rate is extremely low, for events involving people walking (0.2% to 1% of people). They are also evenly low across all sites (including the comparison site) and all time periods.
- The early rush hour shows a spike in near miss events, possibly related to people urgently wishing to finish their work day and are accepting of a higher level of risk

5.2.4 Discussion of Near Miss Analysis

Active Mode Behaviours

- Majority of unsafe acts were likely due to impatience in excessive waiting for the traffic signal. Such as:
  - Walking or cycling parallel to the LRT tracks while the LRT had a clear signal, but the pedestrian or bicycle signal was indicating to stop. People (both while walking or cycling) are observing that all vehicle traffic is stopped and that the only vehicle moving is an LRT that does not block their path.
  - Crossing the LRT tracks while no LRT is present, is slowing to a stop, or has already cleared the intersection.

    - Pedestrians are observing that there are no current conflicts, and that there are no vehicles approaching, however the signal timing is in a phase where they are directed to continue to wait.
  - For pedestrians, behaviours include walking diagonally or corner cutting at the start or end of the pedestrian phases.
  - Completing a crossing while the “Don’t Walk” signal is displayed
    - Many times, pedestrians enter the crossing late in the cycle of “Flashing Don’t Walk” and are stranded in the middle of the crossing once the full “Don’t Walk” is shown. They continue to clear the intersection.
    - The LRT stations along 102 Avenue include an entry-exit point for pedestrians within the median of the roadway. There are separate signal heads for each crossing approaching the median island, indicated a two-stage crossing. Many pedestrians treat this as a single crossing and continue across the intersection while a “Don’t Walk” signal is displayed.
- Due to the smooth transition between the sidewalk and the bicycle tracks, people were often observed walking in the bicycle lane.

It is important to note that many of these behaviours are typical of a high pedestrian density area and are not unique to the study area. The addition of the LRT tracks and bicycle lanes adds to the un-usual behaviours that would not be seen in locations without those elements (ie. pedestrians short cutting across a bike lane, walking parallel to the tracks).

Motorized Vehicle Behaviours

- On very busy and congested periods, queues along 101 Street and 100 Street could extend beyond the train tracks. Drivers would occasionally stop in the middle of the intersection, in an attempt to avoid obstructing the LRT.

Where such un-safe acts become concerning is when they elevate to a near-miss. When a person takes their own risk assessment of the situation and decides to violate right-of-way, if they had not fully assessed all of the risks or other movements then the gap in their assessment can easily result in a near miss or collision. Furthermore, some road users may opt to fully violate right-of-way and place the trust in other road users to avoid a collisions; this situation is quite rare (<1% of events).

5.3 Traffic Conflict Analysis – Computer Vision

In addition to the direct observation near miss analysis, ISL contracted an intelligent traffic safety technology provider to assess a single site along the 102 Avenue corridor. Leveraging this technology permits a more comprehensive and robust road conflict analysis, however the cost of using this service means it could not be deployed across the entire corridor. A single site (102 Avenue and 100 Street) was selected to supplement the direct observation analysis.

Cameras were deployed at 102 Avenue and 100 Street for 24 hours on July 3-4, 2024 (Wednesday overnight into Thursday all day). The weather was pleasant with cloudy and partial cloudy conditions, with a high of 23°C and an overnight low of 9°C. Events in the downtown core resulted in a “typical summer day”, with the NHL Stanley Cup Playoffs having recently terminated and typical programming within Churchill Square resuming.

5.3.1 Outline

AMAG /Ramudden Digital provide road safety solutions throughout Canada, having product lines in Intelligent Traffic Systems (ITS), such as high-tech traffic sensors, intelligent road safety devices, as well as centralized software for deep analysis.

Traffic Conflict Analysis has been researched since the 1970s, however it’s deployment and usage was limited due to the man-power and specialized equipment necessary. With the advent of computer-aided vision, detecting multiple simultaneous road users both spatially and temporarily has resulted in increased research and adoption of this safety analysis technique.

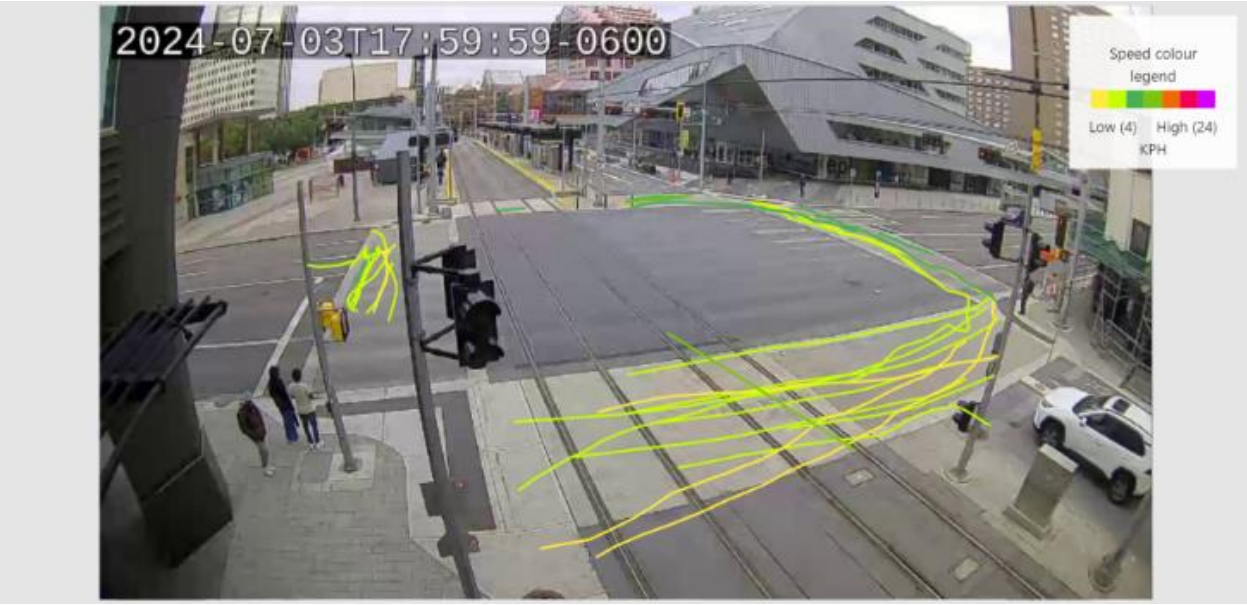

Figure 5.18: Computer-aided trajectory assessment of active mode users at 102 Avenue and 100 Street

Conflict Analysis involves tracking the travel path of road users, comparing their trajectory against other users (Figure 5.18) and then measuring the proximity or probability of a collision event. Commonly used metrics are called Time To Collision (TTC)[7] and Post-Encroachment Time (PET)[8]. Within this report, assessing an interaction as a “near miss” uses a threshold of TTC and/or PET of less than 3 seconds.

5.3.2 Results

This section contains the results, as supplied by AMAG / Ramudden Digital.

Figure 5.19 shows the locations with conflicts as a heatmap, where green colours indicate a low number of recorded events, transitioning into red colours for a large number of recorded events. This heatmap aligns with the directly observed near miss analysis but has also captured some conflict areas that were not recorded by direct observation.

Figure 5.19: Heat Map of conflict locations at 102 Avenue and 100 Street

The total number of conflicts detected in the 24-hour observation period, and the conflict rate, are shown in the table below.

Table 5.3: Total Conflicts from 24 hour video-capture analysis

	Bicycle-Related	E-Scooter-Related	Pedestrian Related	Vehicles Only
Total Conflicts (24hrs)	3	1	82	0
Conflict Rate (per 1000 road users)	4.50	16.13	6.03	0

[7] Time To Collision (TTC) is the time before a collision could / would happen between two objects, *if their speeds and direction would not change*. TTC is a forecasting metric assessing what might happen if no avoidance maneuvres were taken.
[8] Post Encroachment Time (PET) examines a specific conflict location and represents the time difference between when two vehicles occupied the same space. PET is a “past event” based metric evaluating the actual travel paths of two objects to assess how close they came to a collision.

The Near Miss rates recorded by the computer-aided process are lower than the rates recorded by direct observation. This is due to the different criteria each method used to assess what constitutes as a “near miss”:

- Direct Observation recorded a near miss if any road user had to deviate from their travel path (based on human perception), regardless of how small or how far in advance of a conflict the change was made.
- Computer-aided methods record a near miss based on numeric means of assessing the potential for a collision, and by how close in space or time two road users were observed.

Such a technology has a high analytic power and can provide very detailed reporting to traffic safety analysts. It placed a higher importance for the south-crosswalk at 100 Street than the direct observation methods did. Both methods somewhat matched for the east and north crosswalks and heavily agreed that the east crosswalk presented the highest number of conflicts.

City staff have been provided with full access to the analysis provided by AMAG / Ramudden for a more detailed breakdown and inspection of results than can be summarized in this report.

6.0 Conclusions and Recommendations

Overall, the 102 Avenue corridor has seen a net positive change for transportation needs within Edmonton's Downtown core. The addition of a rapid transit line to 102 Avenue, along with a two-way bicycle lane, has drastically changed the way that people use this street. The total number of cars using the corridor has dropped by 87% compared to before the start of construction, while the number of people using active modes of travel has dropped by only 16%.

As described by a key stakeholder, the transformation of this corridor is the start of a transition towards a less car-dependent downtown core while promoting and encouraging freedom of movement of individual persons. This transition presents new challenges, as motorists, cyclists, people walking, people using scooters and people of all means of travel encounter this new layout for the first time.

At the core of the challenges present along this corridor is the tension between the different objectives of the Valley-Line LRT concept: rapid transit service and urban integration. Early guidance for this transit expansion project directed proponents to provide better links to connect transit with neighbouring destinations, and to maximize openness of space by reducing barriers in pedestrian-oriented areas.

During the design stage of this project, a high degree of safety was established due to the interactions created by an urban Light-Rail Transit system. Rather than using crossing arms at typical rail crossings, other means of allocating right-of-way have been used to manage conflicts.

This report has demonstrated a moderate, but significant degree of non-compliance by all types of road users, however the majority of these non-compliance behaviours were of low risk for collisions. This elevated degree of non-compliance may be partially due to the heavily engineered streetscape, that prescribes which spaces are for which modes of travel, rather than permitting a more fluid movement of people. A firm structure has been created, via street signs, signal control devices, and road surface materials, that is meant to set expectations for when and where people should place themselves. Movement conflicts get amplified when one or more people do not follow these expectations.

These expectations are subverted through the reluctance of active mode users to adhere to traffic signals, particularly when there are no approaching vehicles, and they are indicated to wait unnecessarily. This behavior highlights a critical gap in the current traffic management system, where the rigid adherence to signals does not align with the practical needs and behaviors of all road users. Addressing this disconnect by implementing more responsive and adaptive signal systems could enhance compliance and safety, ensuring that the corridor remains a functional and safe space for all users. While preparing this report, the City has expressed a renewed effort to review the signal timings along the Valley Line route, in conjunction with delivery of the Valley Line West project.

RECOMMENDATIONS

This report was commissioned to be an informational assessment of the current operating conditions of the transportation system at 102 Avenue. While firm recommendations of corridor improvements are outside the scope of this document, the following topics should be of consideration for future planning and implementation of improvements.

- Improve the traffic signal programming, actuation and timing along the corridor with a focus on more responsive and adaptive sequencing or overlapping of phases. As of finalizing this report, the City has commenced a review of signal timing in conjunction with the Valley Line West project. The aim should be to identify sequencing of events which result in excessive lost time for both motorists and active mode users.
- Provide additional clarity for drivers to reduce the confusion and cognitive load while navigating the corridor.
- Consider continuing educational campaigns and enforcement campaigns as a means to adjust road user behaviours. The Valley Line LRT team has completed some public education campaigns in 2022 through 2024 targeting a variety of user groups and specific safety aspects. These continued campaigns may be done in addition to or following additional engineering controls targeting concerning patterns of behaviour.
- Improve the signage, particularly in relation to pedestrian and cyclist movements. The City's Traffic Control department is in the process of reviewing the signage along 102 Avenue.
- Consider technological solutions for detecting and communicating the presence of cyclists within the blind spot of motorists, particularly in relation to a right-turn hook type of collision.
- Further analysis of the collision history at 18-months and 36-months post opening to validate the 6-month observations