

## Attachment #1

### **Intersection Network Screening Road Safety Review Safety Implementation Plan Report**



## **Intersection Network Screening Road Safety Review**

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City of New Westminster

Safety Implementation Plan Final Report

August 2023





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## Executive Summary

### Introduction and Background

The **City of New Westminster (the City)** has been improving road safety within its road network based on identified improvements at high collision locations from previous road safety studies, such as the City's *2007 Comprehensive Road Safety Plan* and the *2016 Intersection Safety Review (2016 Study)*, as prepared by **ISL Engineering and Land Services (ISL)**. However, with significant changes in land use, such as major developments/redevelopments in City Centre, Uptown, and the Royal Columbian Hospital, revision to road/intersection conditions within/beyond the boundary of New Westminster (Front Street Mews, Braid Street Greenway, Ewen Avenue Streetscape, and roadways for the current Pattullo Bridge Replacement project), and completed improvements to local intersections in recent years, road user activities and collision trends at New Westminster intersections have changed since the previous studies.

Therefore, the City would like to update the Road Safety Plan, including a review of traffic and collision data, screening for priority locations, assessment of selected site conditions, development of recommended countermeasures and cost estimates, and ranking for implementation in the City's next five-year Capital Program. Ultimately, the study findings can assist the City in prioritizing locations for various mitigating measures (short-, medium-, and long-term basis) for investment to improve the road safety for all road users.

To continue the ongoing commitment to road safety, the City has retained ISL in association with **G. Ho Engineering Consultants Inc. (GHEC)** to conduct the **2022 Intersection Network Screening Road Safety Review (the Study)**, which consists of three phases:

- **Phase 1: Initial Network Screening Analysis**, which included organizing project start-up meeting, reviewing collision and traffic data, establishing and confirming decision tree and selection criteria, conducting initial screening and identifying lists of high-risk locations, and organizing progress meeting.
- **Phase 2: Safety Strategy** (at top locations for following 5 years), which included undertaking secondary network screening, submitting risk identification summary package, organizing study review meeting #1, and conducting correctability analyses and recommending mitigation measures.
- **Phase 3: Road Safety Implementation Plan**, which included preparing draft road safety implementation plan report, organizing study review meeting #2, and preparing final network screening road safety implementation plan report.

### Initial Network Screening Methodology

In the initial network screening, four Safety Performance Indicators (SPIs) were determined for all locations with at least one reported claim using the ICBC's claims data from January 1, 2015 to December 31, 2019:

- **Total Number of Fatal Collisions:** As recorded in ICBC collision data
- **Total Number of Vulnerable Road User (VRU)-involved Collisions:** Total number of pedestrian- or cyclist-involved collisions
- **Annual Collision Frequency (ACF):** 
$$ACF = \frac{\text{Total Number of Collisions from 2015 to 2019}}{5}$$
- **Casualty Percentage (CAS%):** 
$$CAS\% = \frac{\text{Total Number of Casualty Collisions from 2015 to 2019}}{\text{Total Number of Collisions from 2015 to 2019}}$$

Based on the review of calculated SPIs and the consideration of a certain number of locations (over 50), the preliminary list of high-risk intersections for secondary screening was determined. It was determined that the study intersections under MOTI's jurisdiction and/or with recently completed or planned improvements were excluded from the preliminary list.

## Secondary Network Screening Methodology

The observed and critical collision rates, which indicate if the intersection is prone to collisions, were calculated for the preliminary high-risk intersections using the mid-year (2017) average daily traffic (ADT) data provided by the City. For the secondary screening, four selection criteria were suggested and confirmed with the City as follows:

- Observed Collision Rate (CR) over Critical Collision Rate ( $CR_{critical}$ )

$$CR = \frac{\text{Total Number of Collisions from 2015 to 2019}}{ADT \times R_{MEV}}$$

$$CR_{critical} = CR_{avg} + k \sqrt{CR_{avg}/m} + \frac{1}{2m}$$

$$R_{MEV} = \frac{1,826 (\text{Total Number of Days from 2015 to 2019})}{1,000,000}, \quad CR_{avg} = \frac{\text{Total Number of Collisions from 2015 to 2019}}{\text{Five-year Million Entering Vehicles for Top 75 Locations}}$$

k (statistical constant) = 1.64 (for 90% confidence level), m = ADT ×  $R_{MEV}$

- Collision Severity Index (CSI) ≥ the City's average CSI for intersection collisions (4.77)

$$CSI = \frac{100 \times \text{Fatal Collisions} + 10 \times \text{Injury Collisions} + \text{Property Damage Only Collisions}}{\text{5-Year Total Number of Collisions (2015–2019)}}$$

- Total number of VRU-involved collisions ≥ 3
- At least one reported a fatal collision

## Collision Data Review

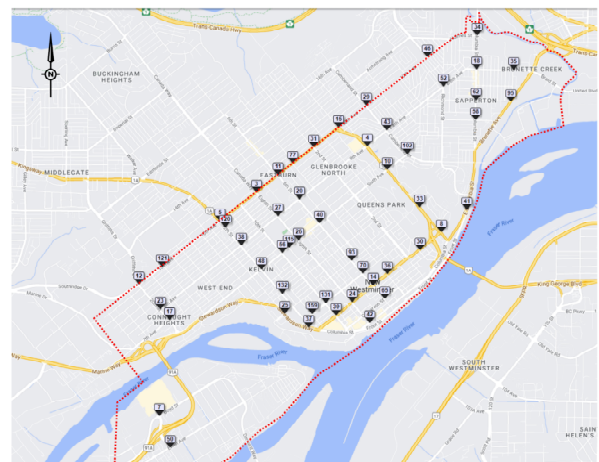
As a standard practice for road safety review studies, the five-year ICBC claims data, between January 1, 2015 and December 31, 2019 provided by the City was reviewed. It was confirmed with the City that the 2020 claims data be excluded for this Study due to various reasons such as reduced traffic volumes/number of collisions caused by the Covid-19 pandemic and the potential delay in finalizing the claims data. The dataset included a total of **28,558** ICBC reported claims. After filtering out the irrelevant claims such as parking-related incidents (10,393 claims), a total of **18,165** claims including intersection collisions (13,234 claims) and mid-block collisions (4,931 claims), were considered for city-wide collision review. Based on the descriptions from claim data, it was also found that 37% of the incidents were reported as casualty (fatal or injury) collisions.



## Initial Network Screening

Based on the agreed **Network Screening Decision Tree**, 51 locations were short-listed as high collision risk:

- 8 locations (5 full traffic signals, 1 pedestrian signal, 2 stop-controlled) reported a fatal collision between 2015-2019.
- 6 locations (6 full traffic signals) with more than or equal to 5 VRU collisions in total.
- 18 locations (18 full traffic signals) have at least 12 collisions per year and a casualty percentage higher than the City's average.
- 19 locations (10 full traffic signals and 9 stop-controlled) with annual collision frequencies over 2, more than 2 VRU collisions, and a casualty percentage more than 38%.



## Mid-Block Collisions Corridor

The mid-block collisions along various major corridors within in City of New Westminster were also reviewed, and the corridors with the high number of collisions (over 60 collisions for 5 years or at least one per month on average) were summarized below:

| S. No. | Corridor Name        | Corridor Type | INJURIES | PDO | Total Collision |
|--------|----------------------|---------------|----------|-----|-----------------|
| 1      | Pattullo Bridge      | Bridge        | 262      | 517 | 779             |
| 2      | Queensborough Bridge | Bridge        | 155      | 202 | 357             |
| 3      | Columbia Street      | Collector     | 51       | 201 | 252             |
| 4      | Stewardson Way       | Arterial      | 46       | 94  | 140             |
| 5      | McBride Boulevard    | Arterial      | 32       | 76  | 108             |
| 6      | Royal Avenue         | Arterial      | 17       | 67  | 84              |
| 7      | E Columbia Street    | Arterial      | 12       | 66  | 78              |
| 8      | Sixth Street         | Collector     | 7        | 61  | 68              |
| 9      | Carnarvon Street     | Collector     | 3        | 64  | 67              |
| 10     | Brunette Avenue      | Arterial      | 14       | 52  | 66              |
| 11     | Eighth Avenue        | Collector     | 13       | 52  | 65              |

Within the City's road network, the bridges appear to be the highest-risk corridors, recording 779 collisions on Pattullo Bridge, and 357 collisions on Queensborough Bridge from 2015 to 2019. It is noted that the mid-block collisions did not include the intersection collisions along the corridors and the number of reported collisions along Pattullo Bridge included both within the Cities of New Westminster and Surry. In addition, Columbia Street, Stewardson Way and McBride Boulevard are the corridors with over 100 collisions for the 5-year study period.

## Comparison with 2016 Study

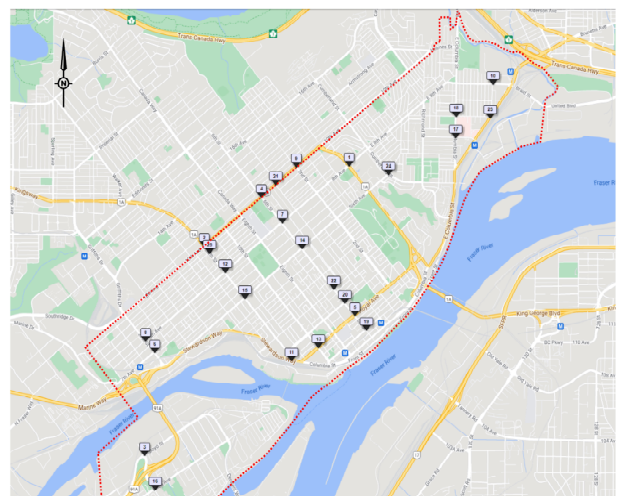
Based on the initial network screening process, 51 high collision intersections were selected. Compared to the 50 high collision risk locations found in the 2016 Study and it was summarized as:

- 28 of them are new locations that were not included in the 2016 Study.
- 23 of them are common high collision risk intersections for both studies.
- 5 intersections in 2016 Study are not considered in this study.

## Identification of Top 25 High-risk Intersections

The total number of intersections selected from initial screening is 51 locations, and then they were further reviewed in secondary screening. Intersections that were identified difficult to provide improvements, were filtered out based on past experience, land availability and site visit.

- 5 intersections, with a total score of three points or above, were selected as top 25. 1 of which is difficult to improve, thus, was not selected for further analysis.
- 14 intersections, with a total score of two points or above, were selected as top 25. 4 of which with lower collision rates, recently improved and difficult to improve were not selected for further analysis.
- 23 intersections had a total score of one point. 12 of which with lower VRU collision, collision rates and casualty percentages were not selected for further analysis.
- 9 intersections were not selected, as they did not meet any criteria.



## Common Safety Issues/Trends for Top 25 Intersections

Based on the collision review and field review, the identified issues (operational, geometric, signal, vulnerable users, and others) for each of the 25 intersections, were summarized and it was noted that the most common safety issues/trends from the 25 intersections include:

### Operational:

- High through volume(s) and queue(s) – *16 intersections*
- On-street parking close to intersection – *12 intersections*
- Considerable lane changing/weaving – *11 intersections*
- Significant heavy vehicle volume(s) – *8 intersections*
- High left-turn volume(s) and queues(s) – *8 intersections*

### Geometric:

- Steep gradient on approach(es) – *16 intersections*
- Wide lane(s) – *12 intersections*

### Signal:

- Poor traffic signal head(s) visibility – *7 intersections*

### Vulnerable Road User:

- Substantial pedestrian crossing volume(s) – *13 intersections*
- Inadequate cyclist facilities – *9 intersections*

### Others:

- Inadequate street lighting – *10 intersections*

## City-wide Countermeasures

According to the results of the common safety issues/trends in Phase 2, the top 10 identified common safety issues/trends were further analyzed to develop potential City-wide countermeasures. These City-wide countermeasures were categorized into phased approaches as follows:

- Short-term (less than 2 years)
- Medium-term (2 to 5 years)
- Long-term (over 5 years)

The City-wide countermeasures for each identified common safety issue/trend were summarized in a table, along with a brief description, sample photos, affected collision types, and number of selected locations with the identified issue.

## Intersection Safety Countermeasures

The collision data analysis results and field review observations were summarized into a two-pages Intersection Safety Review Report with the following information included in each sheet:

- Intersection Information
- Collision Statistics (2015-2019)
- Field Review Observations (June 2022)
- Site Observation Photos
- Potential Improvements



## 1.0 Introduction

The City of New Westminster (the City) has been improving road safety within its road network (**Figure 1.1**) based on identified improvements at high collision locations from previous road safety studies, such as the City's *2007 Comprehensive Road Safety Plan* and the *2016 Intersection Safety Review* (2016 Study), as prepared by ISL Engineering and Land Services (ISL). However, with significant changes in land use, such as major developments/redevelopments in City Centre, Uptown, and the Royal Columbian Hospital, revision to road/intersection conditions within/beyond the boundary of New Westminster (Front Street Mews, Braid Street Greenway, Ewen Avenue Streetscape, and roadways for the current Pattullo Bridge Replacement project), and completed improvements to local intersections in recent years, road user activities and collision trends at New Westminster intersections have changed since the previous studies.

Therefore, the City would like to update the Road Safety Plan, including a review of traffic and collision data, screening for priority locations, assessment of selected site conditions, development of recommended countermeasures and cost estimates, and ranking for implementation in the City's next five-year Capital Program. Ultimately, it is to assist the City in prioritizing locations for various mitigating measures (short-, medium-, and long-term basis) for investment to improve the road safety for all road users.

To continue the ongoing commitment to road safety, the City has retained ISL in association with G. Ho Engineering Consultants Inc. (GHEC) to conduct the *2022 Intersection Network Screening Road Safety Review* (the Study), which consists of three phases:

- Phase 1: Initial Network Screening Analysis
- Phase 2: Safety Strategy (at top locations for following 5 years)
- Phase 3: Road Safety Implementation Plan

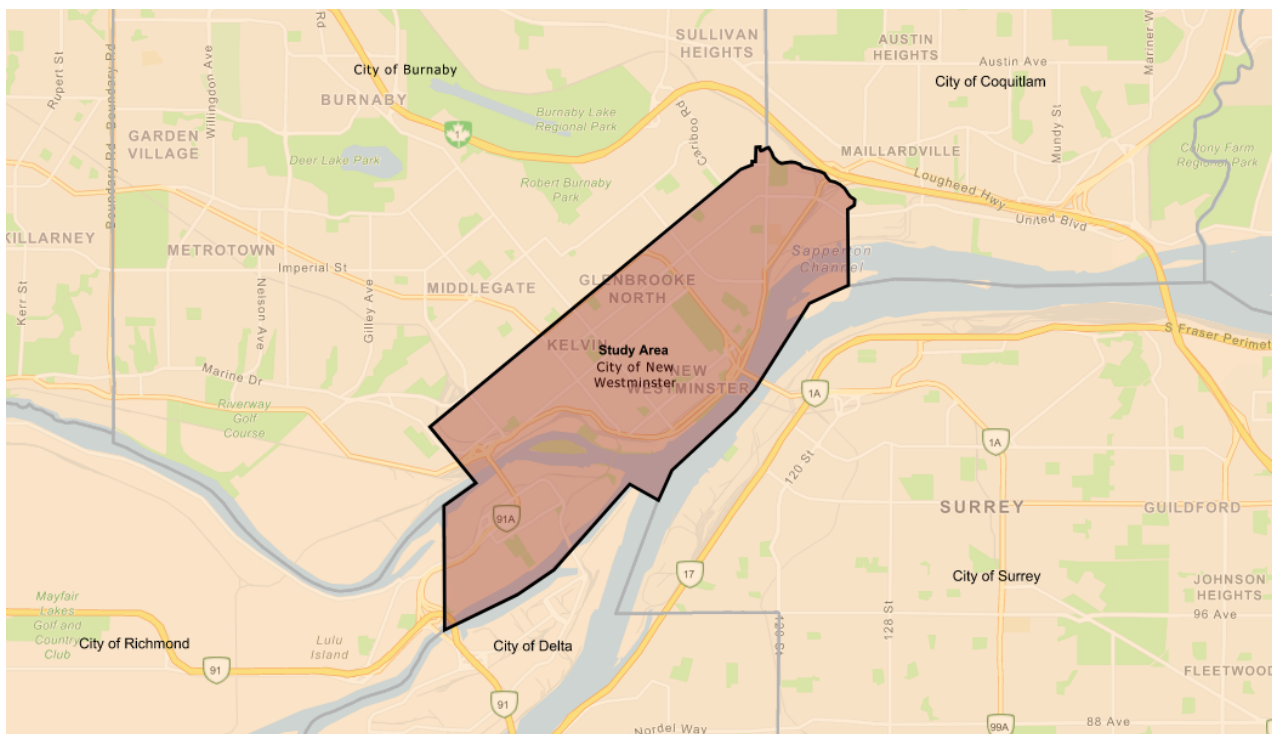


Figure 1.1: Study Area - City of New Westminster



## 2.0 Study Tasks

The following tasks were proposed and completed (except Task 11 and 12 at this stage):

### Phase 1: Initial Network Screening Analysis

1. Organize Project Start-up Meeting – confirmed the scope of work and study jurisdiction with the City as well as the City's expectation of study outcomes and timeline on November 2, 2021.
2. Compile / Review Collision and Traffic Data – collected and reviewed ICBC (2015-2019) claims data, and traffic volumes data, if available.
3. Establish and Confirm Decision Tree and Selection Criteria – developed the network screening decision tree and selection criteria, which were discussed and confirmed with the City during the progress meeting.
4. Conduct Initial Screening and Identify Lists of High-risk Locations – determined safety performance indicators for all intersections and identified the preliminary list of high-risk intersections.
5. Organize Progress Meeting – summarized study findings from Tasks 2 to 4 and presented the confirmed preliminary list of high-risk locations during the progress meeting on April 7, 2022.

### Phase 2: Safety Strategy (at top locations for following 5 years)

6. Undertake Secondary Network Screening (including Field Reviews) – prioritized and identified the high-risk intersections based on additional criteria such as collision rate, collision severity index (CSI), vulnerable road users (VRU) collision confirmed the list of selected 25 intersections with the City on June 24, 2022, and then conducted detailed collision analysis and field reviews by ISL Road Safety Engineers in July 2022 for selected 25 intersections.
7. Submit Risk Identification Summary Package – prepared and submitted an Intersection Safety Review Summary Package to compile and illustrate all study findings during secondary network screening and field reviews, including the list of detailed corridor-wide collisions and intersection safety review summary sheet examples for two intersections (signalized and unsignalized).
8. Organize Study Review Meeting #1 – summarized study findings from Tasks 6 to 7 with the City and organized a review meeting on 24 June 2022.
9. Conduct Correctability Analyses and Recommend Mitigation Measures – identified the top potential city-wide and site-specific issues and provided mitigation measures focusing on key areas under the consideration of engineering, enforcement, education/encouragement, and legislation/regulation.

### Phase 3: Road Safety Implementation Plan

10. Prepare Draft Road Safety Implementation Plan Report – categorized, prioritized, and strategized short-term (less than 2 years), medium-term (2 to 5 years), and long-term (over 5 years) measures for the implementation plan. A comprehensive Draft Implementation Plan Report (this report) summarizing all study processes, findings, and recommendations, was submitted on 30 October 2022 to the City.
11. Organize Study Review Meeting #2 – discussed the feedback on study findings with the City on 31 May 2023 before finalizing the Network Screening Road Safety Implementation report.
12. Prepare Final Network Screening Road Safety Implementation Plan Report – submitted the Final Network Screening Road Safety Implementation Report with the Execute Summary on 21 August 21, 2023 to incorporate all City's comments.

## 3.0 Network Screening Methodology

### 3.1 Initial Network Screening

Based on the safety review practice from the *TAC Canadian Guide to In-service Road Safety Review Guide (TAC Road Safety Guide)*, previous similar network screening studies in the province, and the available collision and traffic data, a network screening methodology (decision tree) was developed for this Study that is illustrated step-by-step in **Figure 3.1**. The decision tree was then confirmed during the progress meeting with the City.

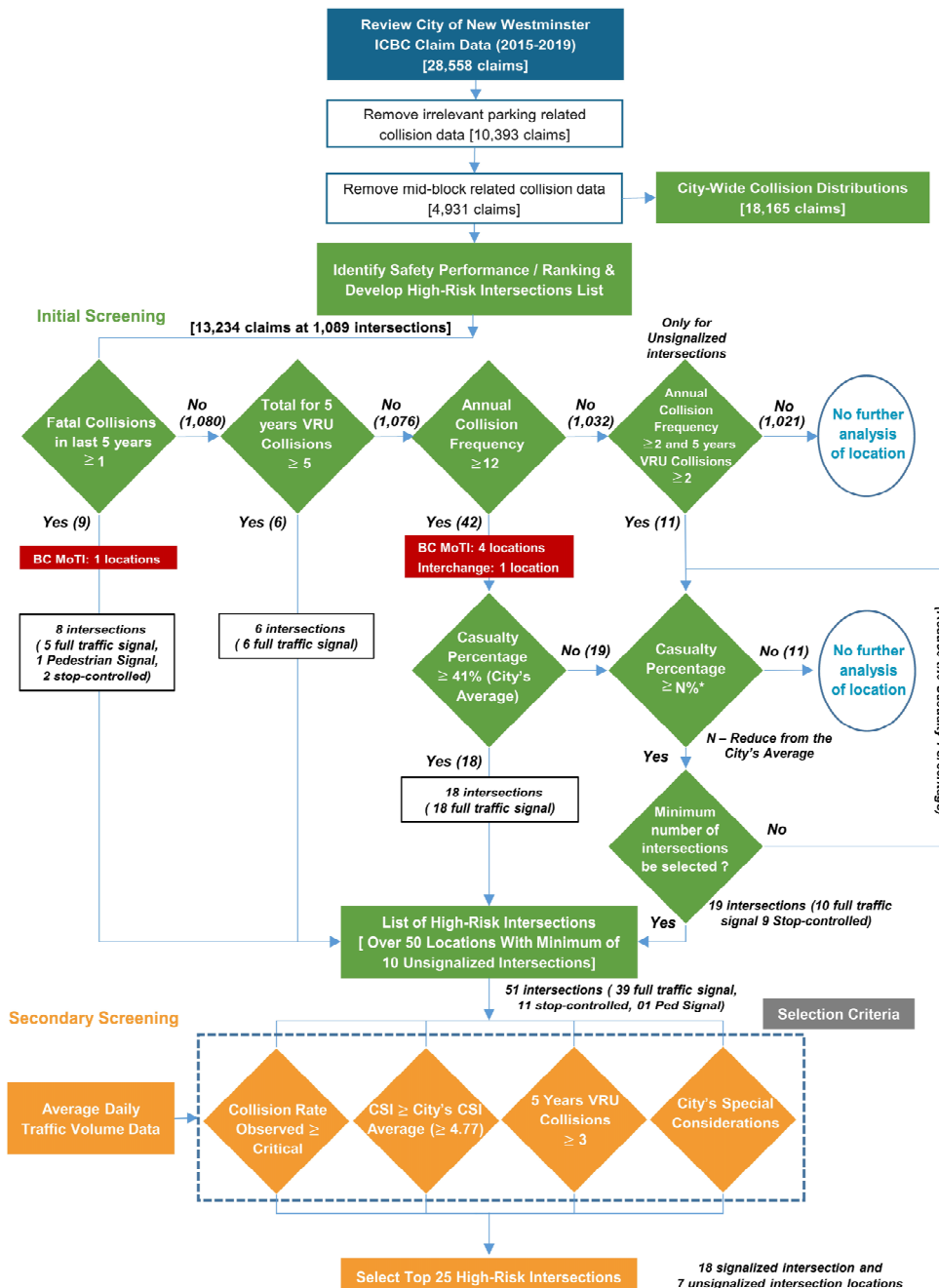


Figure 3.1: Network Screening Decision Tree

Accordingly, in the initial network screening, four Safety Performance Indicators (SPIs) were determined for all locations with at least one reported claim using the ICBC's claims data from January 1, 2015 to December 31, 2019:

- **Total Number of Fatal Collisions:** As recorded in ICBC collision data
- **Total Number of Vulnerable Road User (VRU)-involved Collisions:** Total number of pedestrian- or cyclist-involved collisions
- **Annual Collision Frequency (ACF):**  $ACF = \frac{\text{Total Number of Collisions from 2015 to 2019}}{5}$
- **Casualty Percentage (CAS%):**  $CAS\% = \frac{\text{Total Number of Casualty Collisions from 2015 to 2019}}{\text{Total Number of Collisions from 2015 to 2019}}$

Based on the review of calculated SPIs and the consideration of a certain number of locations (over 50), the preliminary list of high-risk intersections for secondary screening was determined using the following criteria:

- $ACF \geq 12$  (i.e., one collision per month)
- $CAS\% \geq$  the City's average for intersection collisions (41%)
- Intersections with at least one reported a fatal collision
- Total number of VRU-involved collisions  $\geq 5$  (one per year)

However, due to the lower number of collisions for unsignalized intersections, it is agreed that the criteria are revised (see below) to allow a certain number of unsignalized intersections in the list:

- $ACF \geq 2$  and VRU-involved collisions  $\geq 2$
- $CAS\% \geq (38\%)$

Study intersections that meet at least one of the above criteria were considered in the preliminary list. It was determined that the study intersections under MOTI's jurisdiction and/or with recently completed or planned improvements were excluded from the preliminary list.

### 3.2 Secondary Network Screening

The observed and critical collision rates, which indicate if the intersection is prone to collisions, were calculated for the preliminary high-risk intersections using the mid-year (2017) average daily traffic (ADT) data provided by the City. For the secondary screening, four selection criteria were suggested and confirmed with the City as follows:

- Observed Collision Rate (CR) over Critical Collision Rate ( $CR_{critical}$ )

$$CR = \frac{\text{Total Number of Collisions from 2015 to 2019}}{ADT \times R_{MEV}}$$

$$CR_{critical} = CR_{avg} + k \sqrt{CR_{avg}/m} + \frac{1}{2m}$$

$$R_{MEV} = \frac{1,826 (\text{Total Number of Days from 2015 to 2019})}{1,000,000}, \quad CR_{avg} = \frac{\text{Total Number of Collisions from 2015 to 2019}}{\text{Five-year Million Entering Vehicles for Top 75 Locations}}$$

$$k \text{ (statistical constant)} = 1.64 \text{ (for 90\% confidence level)}, \quad m = ADT \times R_{MEV}$$

- Collision Severity Index (CSI)  $\geq$  the City's average CSI for intersection collisions (4.77)

$$CSI = \frac{100 \times \text{Fatal Collisions} + 10 \times \text{Injury Collisions} + \text{Property Damage Only Collisions}}{5\text{-Year Total Number of Collisions (2015-2019)}}$$

- Total number of VRU-involved collisions  $\geq 3$
- At least one reported a fatal collision

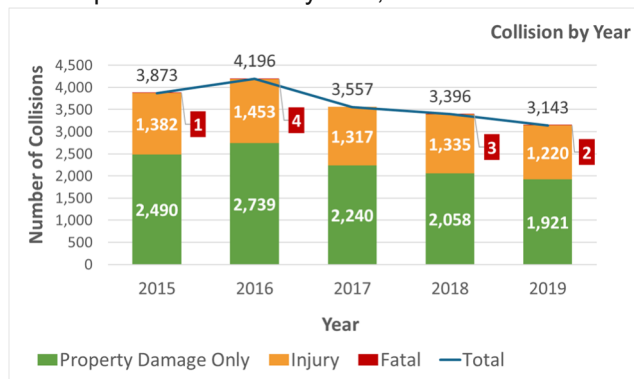
Considering the agreed selection criteria (see **Figure 3.1**), locations with more criteria achieved were selected for further collision analysis and field reviews.

## 4.0 Initial Network Screening Analysis

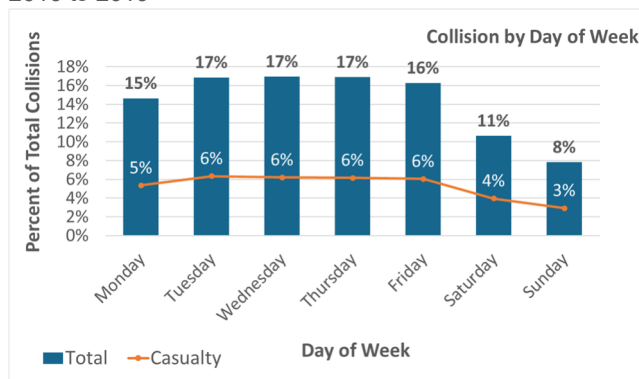
### 4.1 Collision Data and Temporal Distributions

As a standard practice for road safety review studies, the five-year ICBC claims data, between January 1, 2015 and December 31, 2019 provided by the City was reviewed. It was confirmed with the City that the 2020 claims data be excluded for this Study due to various reasons such as reduced traffic volumes/number of collisions caused by the Covid-19 pandemic and the potential delay in finalizing the claims data. The dataset included a total of **28,558** ICBC reported claims. After filtering out the irrelevant claims such as parking-related incidents (10,393 claims), a total of **18,165** claims including intersection collisions (13,234 claims) and mid-block collisions (4,931 claims), were considered for city-wide collision review. Based on the descriptions from claim data, it was also found that 37% of the incidents were reported as casualty (fatal or injury) collisions.

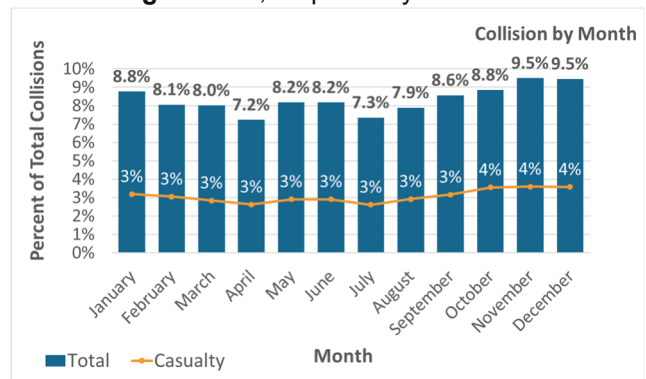
The ICBC claims were then reviewed to identify the year, month, day of week, and starting hour of each reported incident. The temporal collision distributions of all collisions and collisions related to vulnerable road users (VRU), such as pedestrians and cyclists, are summarized in **Figures 4.1** and **Figures 4.2**, respectively.



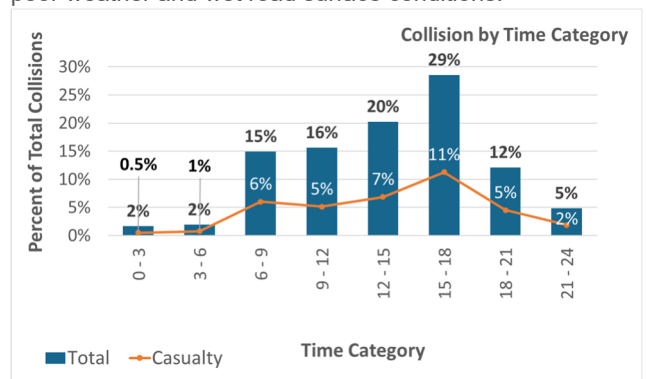
**Yearly:** 2016 had the highest number of total and injury collisions. The total number of collisions decreased from 2016 to 2019, while the casualty percentages were increased from 2016 to 2019



**Daily:** Tuesdays to Thursdays had the highest number of collisions (17%). In general, the number of collisions that occurred on weekdays (16%) is higher than on weekends (9%), which could be due to higher commuter traffic volumes within the City.

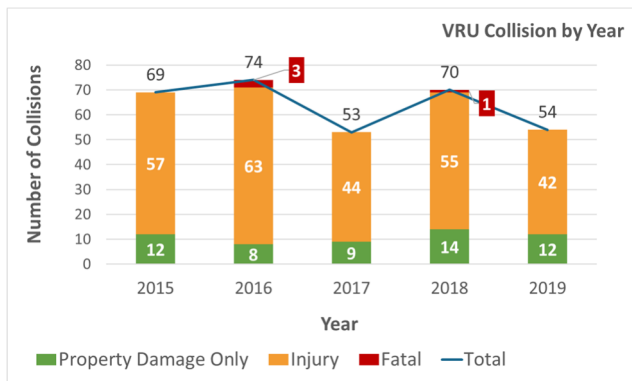


**Monthly:** December and November had the highest percentages of collisions (9.5%). 27% of total collisions occurred in fall (September to November) – could be related to poor weather and wet road surface conditions.

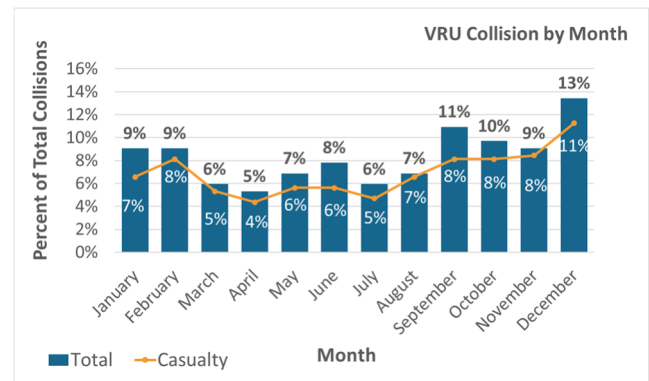


**Hourly:** Using the 3-hour time category as provided in the ICBC dataset, 29% of the total collisions occurred between 1500 and 1800 hours, which tends to be associated with high PM peak traffic volumes and shopping activities/after school time.

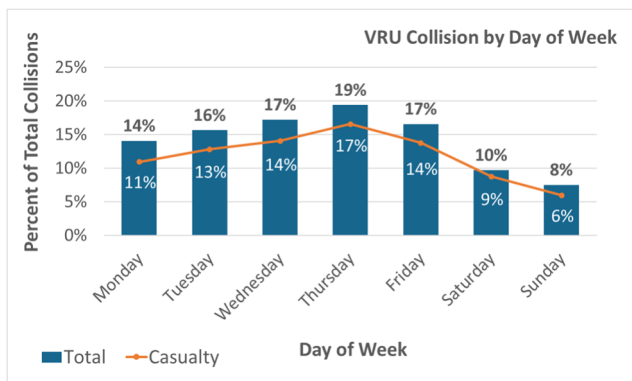
Figures 4.1: Temporal Distributions of City-wide Collisions – ICBC 2015-2019 Claims Data



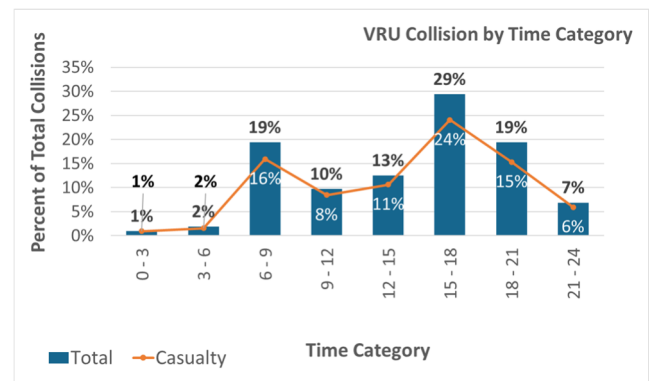
**Yearly:** Out of 320 total VRU collisions, 74 collisions occurred in 2016 (the highest). The total number of collisions and casualty percentages fluctuated through the five-year study period.



**Monthly:** December had the highest number of VRU collisions (13%). 32% of VRU collisions occurred in fall (December to February) – could be related to poor weather, road surface conditions and reduced daytime light.



**Daily:** Thursdays had the highest number of VRU collisions (19%). In general, the number of VRU collisions that occurred on weekdays (17%) is higher than on weekends (9%), which could be due to more conflicts for VRU's with higher commuter traffic volumes in the City.



**Hourly:** Using the 3-hour time category as provided in the ICBC dataset, 29% of the VRU collisions occurred between 1500 and 1800 hours, which tends to be associated with more conflicts for VRU's with high PM peak traffic volumes and shopping activities/after school time.

Figures 4.2: Temporal Distributions of City-wide VRU Collisions – ICBC 2015-2019 Claims Data

## 4.2 Fatal Collisions

Based on the ICBC collision data, 10 fatal collisions occurred between 2015 and 2019. The locations of these fatal collisions are indicated in **Figure 4.3** and the details from the claim data can be found below.

### Spatial Patterns:

- All the ten fatal collisions occurred at intersections and all of them reported in different locations except two incidents found at Stewardson Way & Twelfth Street.
- Five collisions were reported as vehicle-vehicle collisions while four collisions occurred between two conflicting movements, such as left-turn opposing and right angle. The remaining one collision was reported as rear end.
- Four pedestrian-involved collisions– three of which are pedestrian jaywalking cases, while the other one is a pedestrian slipped from the skateboard and fell in front of the vehicle.
- One cyclist-involved collision – a cyclist fell suddenly into the path of a heavy truck.
- One collision occurred in dark conditions with no or minimal illumination.
- Three collisions occurred when the road surface was wet, while one of them happened in rainy weather.



### Temporal Patterns:

- 2016 had the highest number of fatal collisions (four)
- Two collisions were reported for the month of November and June
- Friday had the highest number of fatal collisions (four)
- AM peak (6 AM to 9 AM) and PM peak (3 PM to 6 PM) reported three collisions each

For fatal collisions reported at the 25 selected locations, more detailed descriptions for each collision extracted from ICBC claims are provided in **Section 5.2** of this report.

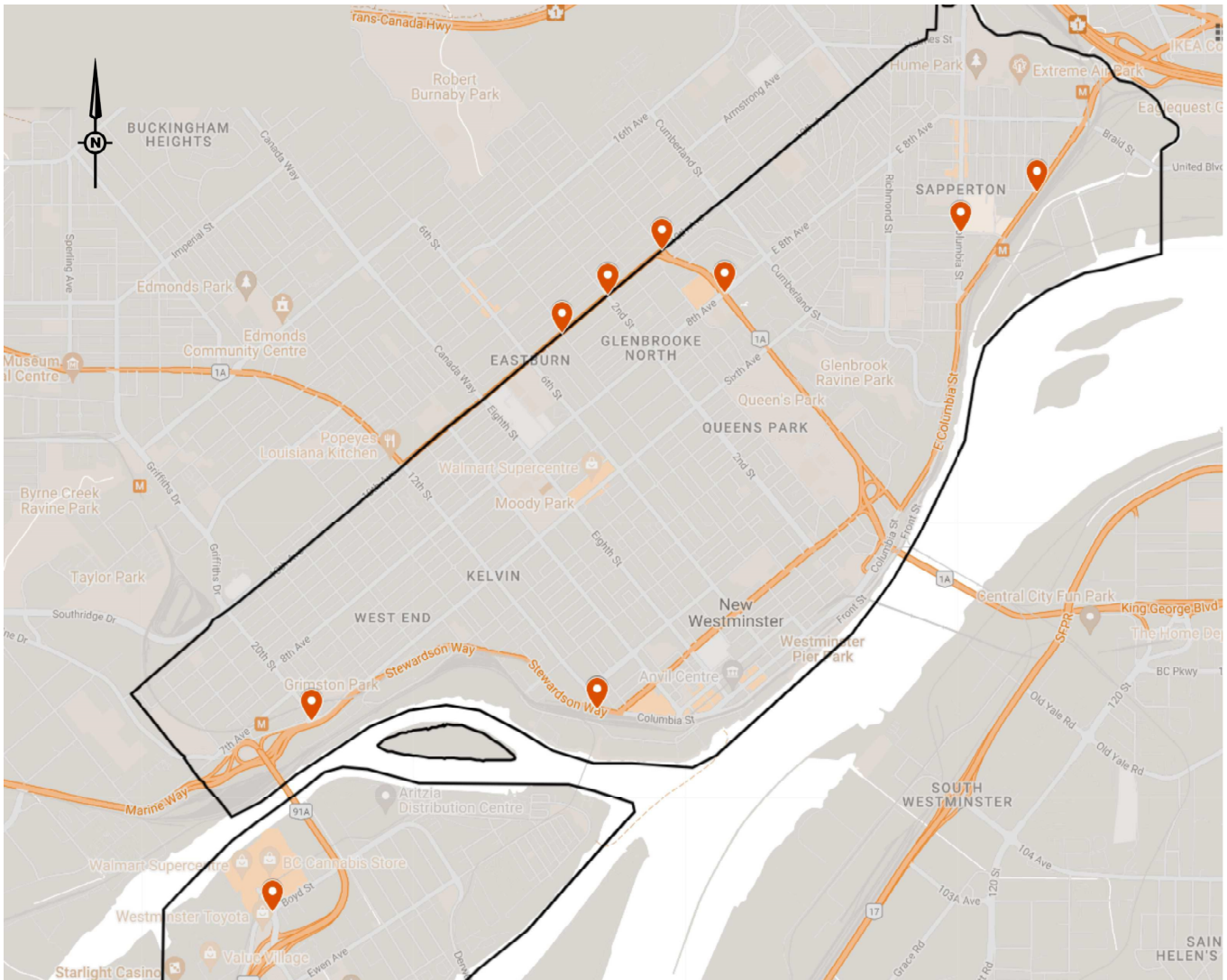


Figure 4.3: Locations of Fatal Collisions (ICBC Collision Data 2015-2019)



### 4.3 Heat Maps

A heat map is a graphical representation to visualize the density of geographic data within a specified area, such as a city, a country, or even the world. It is used to determine the high concentration of collision occurrences within the city, based on the intensity of the colour corresponding to the magnitude of the values that it represents. So that it can help people to focus on certain area(s) in order to handle the identified issues For City's intersections reported no less than ten collisions in a 5-year study period, and the following four heat maps were developed based on ICBC 2015-2019 claims data and included in **Appendix A**.

- 5-year vehicle collisions (also shown in **Figure 4.4**)
- 5-year casualty collisions
- 5-year pedestrian-involved collisions
- 5-year cyclists-involved collisions

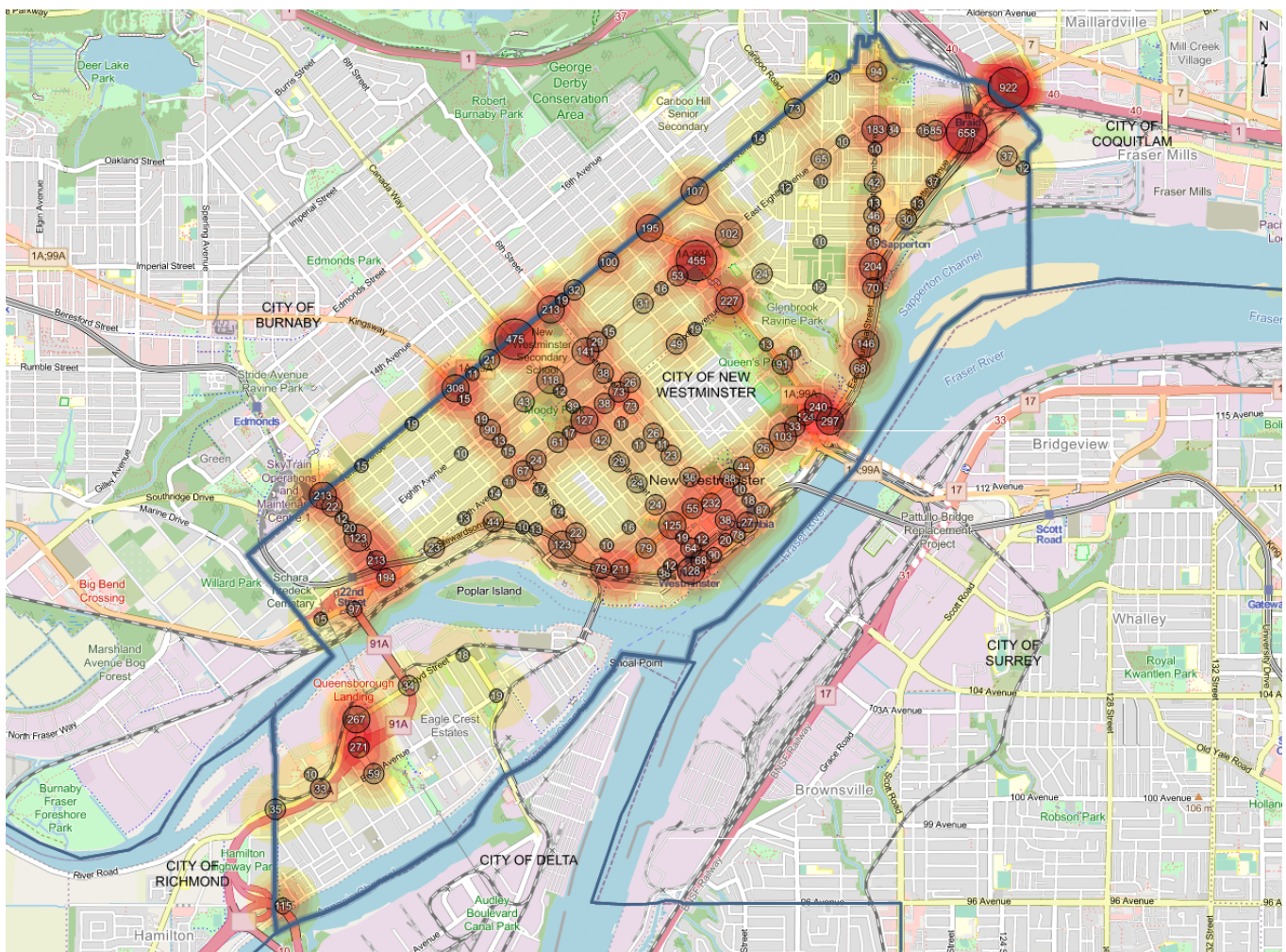


Figure 4.4: 5-year (2015-2019) Vehicle Collisions Heat Map in the City of New Westminster

#### 4.4 Mid-block Collisions Corridor

The mid-block collisions along various major corridors within in City of New Westminster were also reviewed, and the corridors with the high number of collisions (over 60 collisions for 5 years or at least one per month on average) were summarized below:

Table 4.1: Corridor-wide Mid-block Collisions (ICBC 2015-2019)

| S. No. | Corridor Name        | Corridor Type | INJURIES | PDO | Total Collision |
|--------|----------------------|---------------|----------|-----|-----------------|
| 1      | Pattullo Bridge      | Bridge        | 262      | 517 | 779             |
| 2      | Queensborough Bridge | Bridge        | 155      | 202 | 357             |
| 3      | Columbia Street      | Collector     | 51       | 201 | 252             |
| 4      | Stewardson Way       | Arterial      | 46       | 94  | 140             |
| 5      | McBride Boulevard    | Arterial      | 32       | 76  | 108             |
| 6      | Royal Avenue         | Arterial      | 17       | 67  | 84              |
| 7      | E Columbia Street    | Arterial      | 12       | 66  | 78              |
| 8      | Sixth Street         | Collector     | 7        | 61  | 68              |
| 9      | Carnarvon Street     | Collector     | 3        | 64  | 67              |
| 10     | Brunette Avenue      | Arterial      | 14       | 52  | 66              |
| 11     | Eighth Avenue        | Collector     | 13       | 52  | 65              |

Within the City's road network, the bridges appear to be the highest-risk corridors, recording 779 collisions on Pattullo Bridge, and 357 collisions on Queensborough Bridge from 2015 to 2019. It is noted that the mid-block collisions did not include the intersection collisions along the corridors and the number of reported collisions along Pattullo Bridge included both within the Cities of New Westminster and Surry. In addition, Columbia Street, Stewardson Way and McBride Boulevard are the corridors with over 100 collisions for the 5-year study period.

#### 4.5 Initial Network Screening

After filtering out the mid-block incidents (4,931 claims), a total of **18,165** ICBC claims were identified to have occurred across **1,089** intersections within New Westminster (excluding locations under MOTI's jurisdiction). The average casualty percentage was found to be about 37%. The collision data for all 1,089 intersections were reviewed and summarized. The collision summary for all 1,089 intersections is in **Appendix B** which includes ID number, intersection name, ministry/municipality as boundary, 5 years collision numbers, 5-year total number of collisions, annual collision frequency, reported number of fatal collision, total number of casualty collisions, casualty percentage, 5-year VRU-involved (pedestrian and/or cyclist) collisions.

Based on the agreed **Network Screening Decision Tree**, 51 locations were short-listed as high collision risk:

- 8 locations (5 full traffic signals, 1 pedestrian signal, 2 stop-controlled) reported a fatal collision between 2015-2019 (excluded one fatal collision at an intersection operated by MOTI)
- 6 locations (6 full traffic signals) with more than or equal to 5 VRU collisions in total
- 18 locations (18 full traffic signals) have at least 12 collisions per year and a casualty percentage higher than the City's average
- 19 locations (10 full traffic signals and 9 stop-controlled) with annual collision frequencies over 2, more than 2 VRU collisions, and a casualty percentage more than 38%

The locations of selected 51 high collision risk intersections are illustrated in **Figure 4.5** and summarized in **Table 4.2**.

Table 4.2: List of Top 51 High Collision Risk Intersections and Traffic Control (Initial Network Screening)

| ID | Intersection                         | Traffic Control     |
|----|--------------------------------------|---------------------|
| 3  | TENTH AVE & EIGHT ST                 | Full Traffic Signal |
| 4  | EIGHT AVE & MCBRIDE BLVD             | Full Traffic Signal |
| 5  | TENTH AVE & TWELFTH ST               | Full Traffic Signal |
| 7  | BOYD ST & HOWES ST                   | Full Traffic Signal |
| 8  | ROYAL AVE & MCBRIDE BLVD             | Full Traffic Signal |
| 10 | SIXTH AVE & MCBRIDE BLVD             | Full Traffic Signal |
| 11 | TENTH AVE & SIXTH ST                 | Full Traffic Signal |
| 12 | TENTH AVE & TWENTIETH ST             | Full Traffic Signal |
| 14 | ROYAL AVE & SIXTH ST                 | Full Traffic Signal |
| 15 | TENTH AVE & MCBRIDE BLVD             | Full Traffic Signal |
| 17 | SEVENTH AVE & TWENTIETH ST           | Full Traffic Signal |
| 18 | BRAID ST & COLUMBIA ST               | Full Traffic Signal |
| 20 | EIGHTH AVE & SIXTH ST                | Full Traffic Signal |
| 23 | EIGHTH AVE & TWENTIETH ST            | Full Traffic Signal |
| 24 | ROYAL AVE & EIGHTH ST                | Full Traffic Signal |
| 25 | QUAYSIDE DR & STEWARDSON WAY & THIRD | Full Traffic Signal |
| 26 | SIXTH AVE & EIGHTH ST                | Full Traffic Signal |
| 27 | EIGHTH AVE & EIGHTH ST               | Full Traffic Signal |
| 29 | TENTH AVE & CUMBERLAND ST            | Full Traffic Signal |
| 30 | ROYAL AVE & FIRST ST                 | Full Traffic Signal |
| 31 | TENTH AVE & SECOND ST                | Pedestrian Signal   |
| 33 | MCBRIDE BLVD & MEMORIAL DR           | Full Traffic Signal |
| 34 | COLUMBIA ST & HOLMES ST              | Full Traffic Signal |
| 35 | BRAID ST & ROUSSEAU ST               | Full Traffic Signal |
| 36 | ROYAL AVE & FOURTH ST                | Full Traffic Signal |

| ID  | Intersection                 | Traffic Control     |
|-----|------------------------------|---------------------|
| 37  | STEWARDSON WAY & TWELFTH ST  | Full Traffic Signal |
| 38  | EIGHTH AVE & TWELFTH ST      | Full Traffic Signal |
| 39  | ROYAL AVE & TENTH ST         | Full Traffic Signal |
| 40  | SIXTH AVE & SIXTH ST         | Full Traffic Signal |
| 41  | COLUMBIA ST & FRONT ST       | Full Traffic Signal |
| 42  | COLUMBIA ST & EIGHTH ST      | Full Traffic Signal |
| 43  | EIGHTH AVE & CUMBERLAND ST   | Full Traffic Signal |
| 46  | TENTH AVE & SURREY ST        | Full Traffic Signal |
| 48  | SIXTH AVE & TWELFTH ST       | Full Traffic Signal |
| 50  | EWEN AVE & HOWES ST          | Full Traffic Signal |
| 52  | EIGHTH AVE & RICHMOND ST     | Full Traffic Signal |
| 56  | SIXTH AVE & TENTH ST         | Full Traffic Signal |
| 58  | COLUMBIA ST & KEARY ST       | Full Traffic Signal |
| 62  | COLUMBIA ST & SHERBROOKE ST  | Full Traffic Signal |
| 65  | CARNARVON ST & SIXTH ST      | Full Traffic Signal |
| 70  | QUEENS AVE & SIXTH ST        | RRFB                |
| 77  | TENTH AVE & FOURTH ST        | Stop-controlled     |
| 93  | THIRD AVE & SIXTH ST         | Stop-controlled     |
| 95  | BRUNETTE AVE & SHERBROOKE ST | Stop-controlled     |
| 102 | SIXTH AVE & CUMBERLAND ST    | Stop-controlled     |
| 115 | SIXTH AVE & NINTH ST         | RRFB                |
| 120 | LONDON ST & TWELFTH ST       | RRFB                |
| 121 | TENTH AVE & EIGHTEENTH ST    | Stop-controlled     |
| 131 | QUEENS AVE & TENTH ST        | Stop-controlled     |
| 132 | FOURTH AVE & TWELFTH ST      | Stop-controlled     |
| 159 | QUEENS AVE & ELEVENTH ST     | Stop-controlled     |

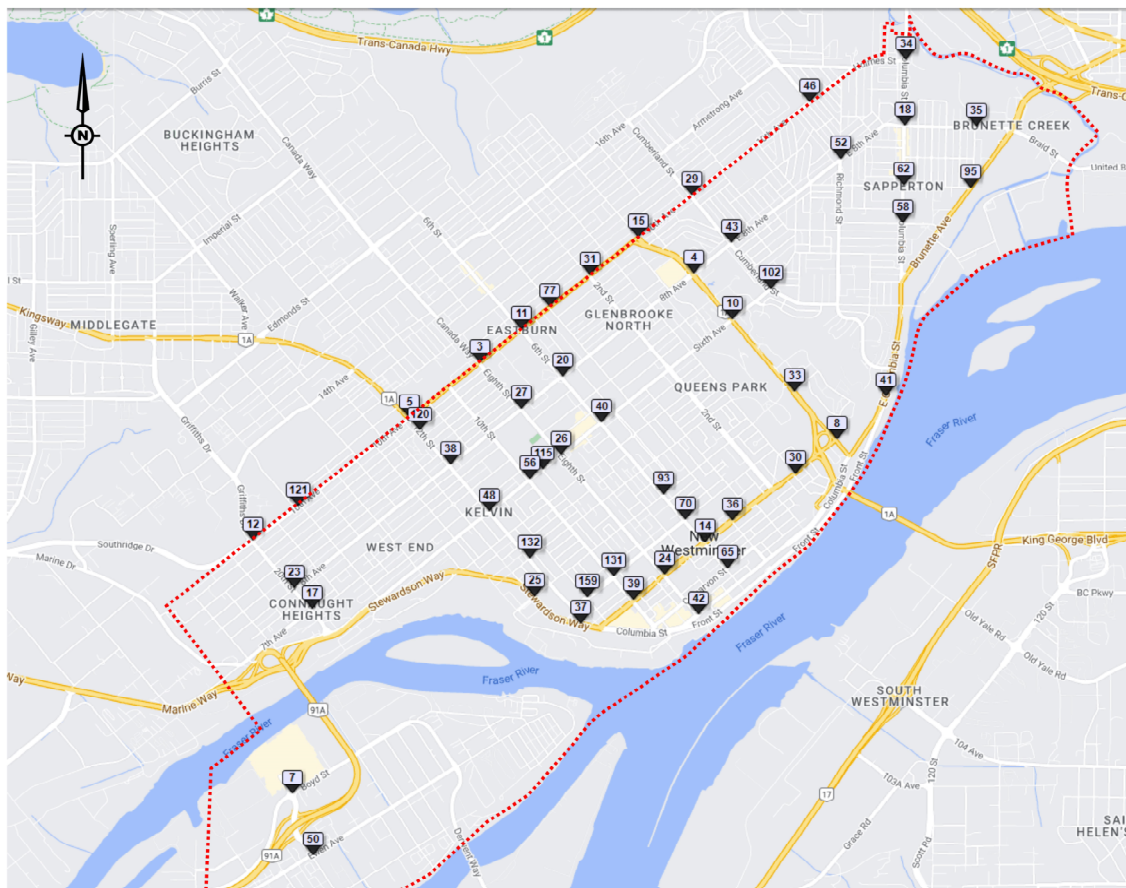


Figure 4.5: Top 51 High Collision Risk Intersections and Total Number of Collisions (2015-2019)



## 4.6 Comparison with 2016 Study

Based on the initial network screening process, 51 high collision intersections were selected. Compared to the 50 high collision risk locations found in the 2016 Study, similarities and differences are summarized in **Table 4.3** and **Figure 4.6**, and it was summarized as:

- 28 of them are new locations that were not included in the 2016 Study
- 23 of them are common high collision risk intersections for both studies
- 5 intersections in 2016 Study are not considered in this study

Table 4.3: High Collision Risk Intersections Comparison between 2016 and 2022 Studies

| ID | INTERSECTION  | INTERSECTION TYPE   | SELECTED YEARS                         | ID  | INTERSECTION                                     | INTERSECTION TYPE   | SELECTED YEARS                         |
|----|---|---------------------|--|-----|--|---------------------|--|
| 3  | TENTH AVE & CANADA WAY & EIGHT ST                       | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 39  | ROYAL AVE & TENTH ST                             | Full Traffic Signal | Selected in 2022 Study                 |
| 4  | MCBRIDE BLVD & 8TH AVE / E 8TH AVE                      | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 46  | SIXTH AVE & SIXTH ST                             | Full Traffic Signal | Selected in both 2022 and 2016 Studies |
| 5  | KINGSWAY & TENTH AVE                                    | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 40  | TENTH AVE & CARIBOO RD & E TENTH AVE & SURREY ST | Full Traffic Signal | Selected in both 2022 and 2016 Studies |
| 7  | BOYD ST & HOWES ST & TURNING LANE                       | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 41  | E COLUMBIA ST & FRONT ST                         | Full Traffic Signal | Selected in 2022 Study                 |
| 8  | E ROYAL AVE & MCBRIDE BLVD & ROYAL AVE                  | Full Traffic Signal | Selected in 2022 Study                 | 42  | COLUMBIA ST & EIGHTH ST                          | Full Traffic Signal | Selected in 2022 Study                 |
| 10 | E SIXTH AVE & MCBRIDE BLVD & SIXTH AVE                  | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 48  | SIXTH AVE & TWELFTH ST                           | Full Traffic Signal | Selected in both 2022 and 2016 Studies |
| 11 | TENTH AVE & SIXTH ST                                    | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 52  | E EIGHTH AVE & RICHMOND ST                       | Full Traffic Signal | Selected in 2022 Study                 |
| 12 | TENTH AVE & GRIFFITHS DR & SOUTHRIDGE DR & TWENTIETH ST | Full Traffic Signal | Selected in 2022 Study                 | 56  | SIXTH AVE & TENTH ST                             | Full Traffic Signal | Selected in 2022 Study                 |
| 14 | SIXTH ST & ROYAL AVE                                    | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 50  | EWEN AVE & HOWES ST                              | Full Traffic Signal | Selected in 2022 Study                 |
| 15 | MCBRIDE BLVD & TENTH AVE                                | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 58  | E COLUMBIA ST & KEARY ST                         | Full Traffic Signal | Selected in 2022 Study                 |
| 18 | BRAD ST & EAST COLUMBIA ST                              | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 62  | E COLUMBIA ST & SHERBROOKE ST                    | Full Traffic Signal | Selected in 2022 Study                 |
| 17 | TWENTIETH ST & SEVENTH AVE                              | Pedestrian Signal   | Selected in both 2022 and 2016 Studies | 65  | CARNARVON ST & SIXTH ST                          | Full Traffic Signal | Selected in 2022 Study                 |
| 20 | EIGHTH AVE & SIXTH ST                                   | Full Traffic Signal | Selected in 2022 Study                 | 70  | QUEENS AVE & SIXTH ST                            | Stop-controlled     | Selected in 2022 Study                 |
| 26 | SIXTH AVE & EIGHTH ST                                   | Full Traffic Signal | Selected in 2022 Study                 | 77  | TENTH AVE & FOURTH ST                            | Stop-controlled     | Selected in 2022 Study                 |
| 24 | EIGHTH ST & ROYAL AVE                                   | Full Traffic Signal | Selected in 2022 Study                 | 102 | CUMBERLAND ST & E SIXTH AVE                      | Stop-controlled     | Selected in 2022 Study                 |
| 23 | EIGHTH AVE & TWENTIETH ST                               | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 93  | SIXTH ST & THIRD AVE                             | Stop-controlled     | Selected in 2022 Study                 |
| 25 | QUAYSIDE DR & STEWARDSON WAY & THIRD AVE                | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 95  | BRUNETTE AVE & SHERBROOKE ST                     | Stop-controlled     | Selected in 2022 Study                 |
| 27 | EIGHTH AVE & EIGHTH ST                                  | Full Traffic Signal | Selected in 2022 Study                 | 115 | NINTH ST & SIXTH AVE                             | Stop-controlled     | Selected in 2022 Study                 |
| 29 | TENTH AVE & CUMBERLAND ST                               | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 131 | QUEENS AVE & TENTH ST                            | Stop-controlled     | Selected in 2022 Study                 |
| 30 | ROYAL AVE & FIRST ST                                    | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 120 | LONDON ST & TWELFTH ST                           | Stop-controlled     | Selected in 2022 Study                 |
| 43 | CUMBERLAND ST & E EIGHTH AVE                            | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 121 | TENTH AVE & EIGHTEENTH ST                        | Stop-controlled     | Selected in 2022 Study                 |
| 31 | TENTH AVE & SECOND ST                                   | Pedestrian Signal   | Selected in both 2022 and 2016 Studies | 132 | FOURTH AVE & TWELFTH ST                          | Stop-controlled     | Selected in 2022 Study                 |
| 34 | EAST COLUMBIA ST & HOLMES ST                            | Pedestrian Signal   | Selected in both 2022 and 2016 Studies | 159 | ELEVENTH ST & QUEENS AVE                         | Stop-controlled     | Selected in 2022 Study                 |
| 33 | MCBRIDE BLVD & MEMORIAL DR                              | Pedestrian Signal   | Selected in 2022 Study                 | 51  | COLUMBIA ST & FOURTH ST                          | Full Traffic Signal | Selected in 2016 Study                 |
| 38 | EIGHTH AVE & TWELFTH ST                                 | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 53  | BEGBIE ST & COLUMBIA ST                          | Full Traffic Signal | Selected in 2016 Study                 |
| 36 | FOURTH ST & ROYAL AVE                                   | Full Traffic Signal | Selected in 2022 Study                 | 44  | EAST COLUMBIA ST & CUMBERLAND ST                 | Stop-controlled     | Selected in 2016 Study                 |
| 35 | BRAD ST & ROUSSEAU ST                                   | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 72  | EIGHTH ST & FIFTH AVE                            | Stop-controlled     | Selected in 2016 Study                 |
| 37 | STEWARDSON WAY & TWELFTH ST                             | Full Traffic Signal | Selected in both 2022 and 2016 Studies | 214 | DUBLIN ST & EIGHTH ST                            | Pedestrian Signal   | Selected in 2016 Study                 |

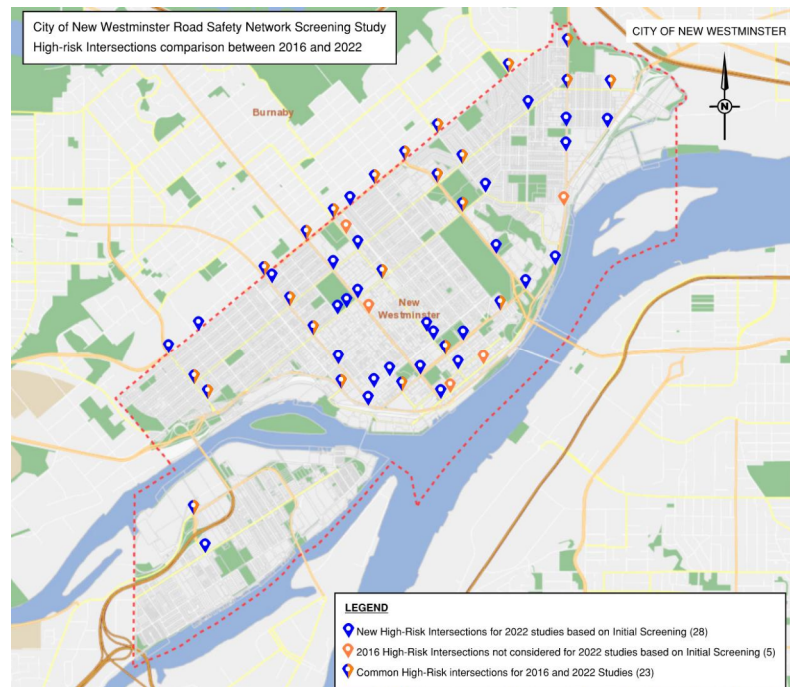


Figure 4.6: High-risk Intersections Comparison between 2016 and 2022 Studies

## 5.0 Secondary Network Screening

### 5.1 Identification of Top 25 High-risk Intersections

The total number of intersections selected from initial screening is 51 locations, and then they were further reviewed in secondary screening. Intersections that were identified difficult to provide improvements, were filtered out based on past experience, land availability and site visit.

- 5 intersections, with a total score of three points or above, were selected as top 25. 1 of which is difficult to improve, thus, was not selected for further analysis
- 14 intersections, with a total score of two points or above, were selected as top 25. 4 of which with lower collision rates, recently improved and difficult to improve were not selected for further analysis
- 23 intersections had a total score of one point. 12 of which with lower VRU collision, collision rates and casualty percentages were not selected for further analysis.
- 9 intersections were not selected, as they did not meet any criteria.

The 25 selected high collision risk intersections are illustrated in **Figure 5.1**, and the summary of the selection criteria assessment is provided in **Table 5.1**.

### 5.2 Fatal Collisions

Although the number of fatal collisions has already been considered in the collision severity index calculations, the occurrence of fatal collisions could have significant impacts on the community. The descriptions of eight fatal collisions reported at the top 25 high collision risk intersections are as follows:

- McBride Boulevard and Eighth Avenue (Site #1) – a pedestrian was hit by a westbound vehicle when jaywalking on McBride Boulevard, around 2:30 PM in November 2016.
- Boyd Street and Howes Street (Site #3) – a skateboarding pedestrian fell onto roadway and was hit by an eastbound truck around 1:00 PM in April 2018.
- Tenth Avenue and Second Street (Site #9) – a right angle collision between eastbound and southbound vehicles around 4:00 AM in December 2019.
- Stewardson Way and Twelfth Street (Site #11) – a left-turn opposing collision between an eastbound left-turn motorcyclist and a westbound vehicle around 8:45 AM in May 2015.
- Stewardson Way and Twelfth Street (Site #11) – a rear-end collision with 3 eastbound vehicles involved around 15:30 PM in June 2018.
- Columbia Street and Keary Street (Site #17) – a crossing pedestrian was hit by a southbound semi-truck around 6:15 AM in January 2016.
- Tenth Avenue and Fourth Street (Site #21) – a left-turn opposing collision between an eastbound vehicle and a westbound left-turn vehicle around 8:15AM in June 2018.
- Brunette Avenue and Sherbrooke Street (Site #23) – a cyclist fell from the bike and was hit by a northbound truck around 8:15 AM in June 2018.

Table 5.1: Selection Criteria Assessment for Top 25 High Collision Risk Intersections

| Location Information |                              |                     | 5-Year Total Number of Collisions | 5-Year VRU Collisions | Secondary Screening Decision Criteria             |                           |  |              | Selection Rationale   |
|----------------------|------------------------------|---------------------|-----------------------------------|-----------------------|---|---------------------------|--|--------------|---|
| Site No              | Intersection                 | Traffic Control     |                                   |                       | Observed Collision Rate > Critical Collision Rate | 5-Year VRU Collisions ≥ 3 | Intersection CSI > City-Wide CSI (≥4.77) | Total Points |   |
| 1                    | EIGHTH AVE & MCBRIDE BLVD    | Full Traffic Signal | 455                               | 7                     | ✓   | ✓                         | x  | 2            | Selected (Reported High VRU Collision)                                      |
| 2                    | TENTH AVE & TWELFTH ST       | Full Traffic Signal | 308                               | 4                     | ✓   | ✓                         | ✓  | 3            | Selected (High Total Score for Signalized Intersection)                     |
| 3                    | BOYD ST & HOWES ST           | Full Traffic Signal | 267                               | 9                     | ✓   | ✓                         | ✓  | 3            | Selected (High Total Score for Signalized Intersection)                     |
| 4                    | TENTH AVE & SIXTH ST         | Full Traffic Signal | 213                               | 4                     | ✓   | ✓                         | ✓  | 3            | Selected (High Total Score for Signalized Intersection)                     |
| 5                    | ROYAL AVE & SIXTH ST         | Full Traffic Signal | 200                               | 2                     | ✓   | x                         | x  | 1            | Selected (Observed Collision Rate is more than the Critical Collision Rate) |
| 6                    | SEVENTH AVE & TWENTIETH ST   | Full Traffic Signal | 174                               | 5                     | ✓   | ✓                         | x  | 2            | Selected (Reported High VRU Collision)                                      |
| 7                    | EIGHTH AVE & SIXTH ST        | Full Traffic Signal | 141                               | 3                     | x   | ✓                         | ✓  | 2            | Selected (Reported High VRU Collision)                                      |
| 8                    | EIGHTH AVE & TWENTIETH ST    | Full Traffic Signal | 123                               | 4                     | ✓   | ✓                         | ✓  | 3            | Selected (High Total Score for Signalized Intersection)                     |
| 9                    | TENTH AVE & SECOND ST        | Pedestrian Signal   | 100                               | 0                     | ✓   | x                         | ✓  | 2            | Selected (High Total Score for Unsignalized Intersection)                   |
| 10                   | BRAD ST & ROUSSEAU ST        | Full Traffic Signal | 85                                | 2                     | x   | x                         | ✓  | 1            | Selected (Intersection CSI is more than Citywide CSI)                       |
| 11                   | STEWARTSON WAY & TWELFTH ST  | Full Traffic Signal | 79                                | 2                     | x   | x                         | ✓  | 1            | Selected (Reported Fatal Collision)   |
| 12                   | EIGHTH AVE & TWELFTH ST      | Full Traffic Signal | 90                                | 2                     | x   | x                         | ✓  | 1            | Selected (Intersection CSI is more than Citywide CSI)                       |
| 13                   | ROYAL AVE & TENTH ST         | Full Traffic Signal | 79                                | 4                     | x   | ✓                         | ✓  | 2            | Selected (Reported High VRU Collision)                                      |
| 14                   | SIXTH AVE & SIXTH ST         | Full Traffic Signal | 73                                | 6                     | x   | ✓                         | x  | 1            | Selected (Reported High VRU Collision)                                      |
| 15                   | SIXTH AVE & TWELFTH ST       | Full Traffic Signal | 67                                | 4                     | x   | ✓                         | ✓  | 2            | Selected (Reported High VRU Collision)                                      |
| 16                   | EWEN AVE & HOWES ST          | Full Traffic Signal | 59                                | 6                     | x   | ✓                         | x  | 1            | Selected (Reported High VRU Collision)                                      |
| 17                   | COLUMBIA ST & KEARY ST       | Full Traffic Signal | 46                                | 4                     | x   | ✓                         | ✓  | 2            | Selected (Reported High VRU Collision)                                      |
| 18                   | COLUMBIA ST & SHERBROOKE ST  | Full Traffic Signal | 42                                | 5                     | x   | ✓                         | x  | 1            | Selected (Reported High VRU Collision)                                      |
| 19                   | CARNARVON ST & SIXTH ST      | Full Traffic Signal | 38                                | 5                     | x   | ✓                         | ✓  | 2            | Selected (Reported High VRU Collision)                                      |
| 20                   | QUEENS AVE & SIXTH ST        | RRFB                | 36                                | 2                     | ✓   | x                         | ✓  | 2            | Selected (High Total Score for Unsignalized Intersection)                   |
| 21                   | TENTH AVE & FOURTH ST        | Stop-controlled     | 32                                | 0                     | x   | x                         | ✓  | 1            | Selected (Reported Fatal Collision)   |
| 22                   | THIRD AVE & SIXTH ST         | Stop-controlled     | 23                                | 4                     | x   | ✓                         | ✓  | 2            | Selected (High Total Score for Unsignalized Intersection)                   |
| 23                   | BRUNETTE AVE & SHERBROOKE ST | Stop-controlled     | 22                                | 2                     | x   | x                         | ✓  | 1            | Selected (Reported Fatal Collision)   |
| 24                   | SIXTH AVE & CUMBERLAND ST    | Stop-controlled     | 24                                | 3                     | x   | x                         | ✓  | 1            | Selected (CSI > City's Average for Unsignalized Intersection)               |
| 25                   | LONDON ST & TWELFTH ST       | RRFB                | 15                                | 2                     | x   | x                         | ✓  | 1            | Selected (CSI > City's Average for Unsignalized Intersection)               |

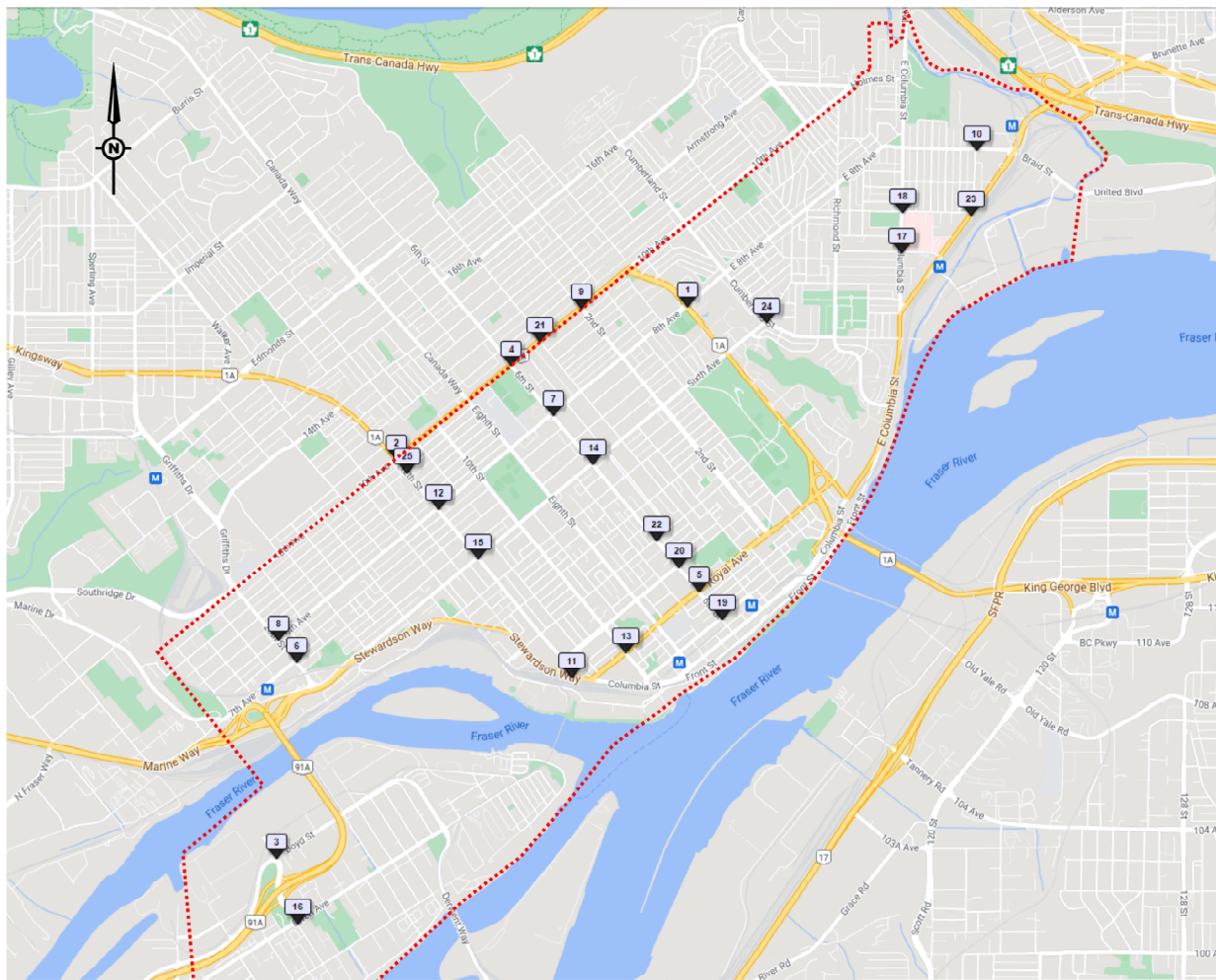


Figure 5.1: Top 25 High Collision Risk Intersections and Site Number



### 5.3 Field Review

Field reviews of the top 25 high-risk intersections were conducted in mid-June of 2022, where photographs, videos, and site observation notes were taken by three road safety engineers (**Borg Chan, P.Eng., PTOE, RSP, FITE; Sai Shoben Madurai Sekar, EIT and Kyle Li, EIT**). All 25 selected intersections were examined by a drive-through/walk-through for all intersection approaches, providing safety reviewers with motorists and other road users perspectives of potential traffic safety issues.

During the walk-through field reviews, potential safety issues were identified for all road users, using the *Transportation Association of Canada (TAC) Site Visit Sample Observation Report* from the *TAC Road Safety Review Guide*. The TAC Report has a list of questions, including both physical and operational checklists, to be completed during and after the field reviews to identify the existing and potential safety issues.



Field Review on June 14, 2022  
(Boyd Street & Howes Street)



Field Review on June 16, 2022  
(Columbia Street & Keary Street)

### 5.4 Common Safety Issues/Trends for Top 25 Intersections

The identified issues (operational, geometric, signal, vulnerable users, and others) for each of the 25 intersections, were summarized in a table which can be found in **Appendix C**. It was noted that the most common safety issues/trends from the 25 intersections include:

#### Operational:

- High through volume(s) and queue(s) – 16 intersections
- On-street parking close to intersection – 12 intersections
- Considerable lane changing/weaving – 11 intersections
- Significant heavy vehicle volume(s) – 8 intersections
- High left-turn volume(s) and queues(s) – 8 intersections

#### Geometric:

- Steep gradient on approach(es) – 16 intersections
- Wide lane(s) – 12 intersections

#### Signal:

- Poor traffic signal head(s) visibility – 7 intersections

#### Vulnerable Road User:

- Substantial pedestrian crossing volume(s) – 13 intersections
- Inadequate cyclist facilities – 9 intersections

#### Others:

- Inadequate street lighting – 10 intersections

Meanwhile, the top intersections (shown in **Figure 5.2**) with the highest number of identified issues were:

- Tenth Avenue and Twelfth Street – 16
- Boyd Street and Howe Street – 14
- McBride Boulevard and Eighth Avenue – 12
- Tenth Avenue and Sixth Street – 12
- Tenth Avenue and Second Street – 12
- Eighth Avenue and Twentieth Street – 11
- Royal Avenue and Sixth Street – 10
- Braid Street and Rousseau Street – 10
- Eighth Avenue and Twelfth Street – 9
- Sixth Avenue and Twelfth Street – 9
- Columbia Street and Keary Street – 9

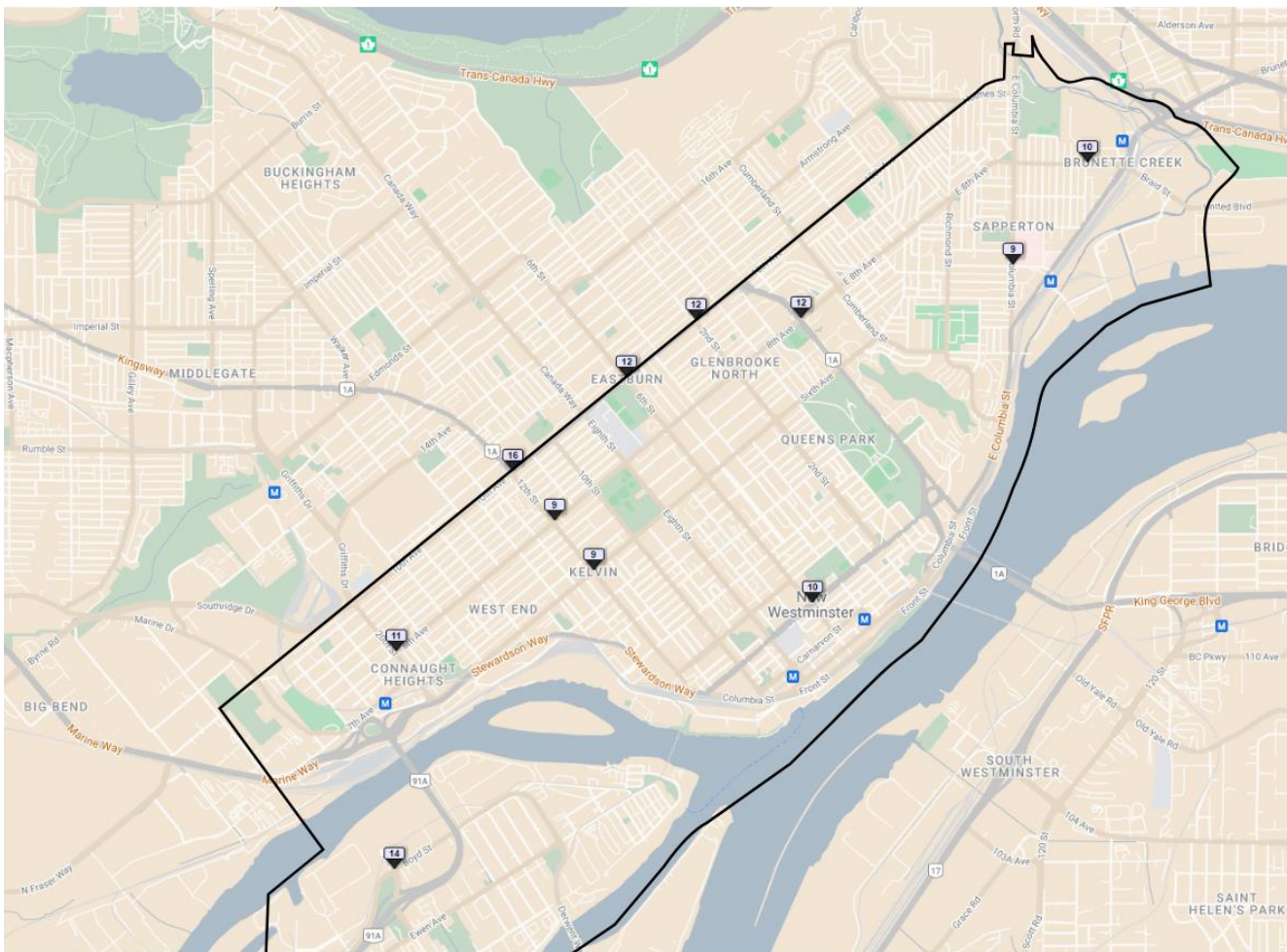


Figure 5.2: Locations with High Number of Identified Issues

## 6.0 Road Safety Implementation Plan

### 6.1 City-wide Countermeasures

Based on the results of the common safety issues/trends in Phase 2, the top 10 identified common safety issues/trends were further analyzed to develop potential City-wide countermeasures. These City-wide countermeasures were categorized into phased approaches as follows:

- Short-term (less than 2 years)
- Medium-term (2 to 5 years)
- Long-term (over 5 years)

The City-wide countermeasures for each identified common safety issue/trend were summarized in a table, along with a brief description, sample photos, affected collision types, and number of selected locations with the identified issue. The summary table of each City-wide countermeasure can be found in **Appendix D**.

### 6.2 Intersection Safety Countermeasures

The collision data analysis results and field review observations were summarized into a two-pages Intersection Safety Review Report that can be found in **Appendix E**. The following information is included in each sheet:

Intersection Information:

- Site Number – based on the annual collision frequency ranking
- Approach Leg – number of legs
- Traffic Control Type – e.g., signalized - P/P (protected/permissive) LT (left-turn) in all directions
- Road Class (N-S) & (E-W) – obtained from the City's GIS Map
- Surrounding Land Use – e.g., residential, commercial, institution, etc.
- Daily Traffic Volume (2017) – based on 2017 (mid-year) ADT volume provided by the City
- Existing Lane Configurations and Recent Improvements – Aerial photos with bicycle facilities, lane configurations and recent improvements

Collision Statistics (2015-2019):

- Collision Frequency (per year) and Total Number of Collisions (5-year)
- Collision Severity Index and Casualty Percentage
- Observed and Critical Collision Rates
- Collision with Pedestrians and Cyclists
- Collision Distribution by Year and Severity
- Highest Percentage of Total Collisions by Month, Average Weekday / Weekend, and Highest Percentage Time Period
- Top Three Collision Types with the Percentage of Total Collisions (based on 2017-2019 ICBC claims data)
- Overrepresentation of Casualty/ VRU collisions and collision type (based on 2017-2019 ICBC claims data); Chi-Square test was performed to identify the difference between each parameter (casualty %, VRU collisions, or collision type) at a single intersection and the average value obtained from all intersections.

Field Review Observations (June 2022):

- Operational – observed and expected traffic operations
- Geometric – such as intersection layout, lane configuration, and nearby driveways
- Signal (traffic control) – traffic signal characteristics, such as phasing, movement restrictions, and advance warning flasher

- Vulnerable Road User – activities, infrastructure, and conflicts with vehicles
- Other – such as missing road sign, presence of red-light/speed cameras, and on-street parking provision

#### Site Observation Photos:

- Site Photos – selected two field review photos indicating relevant site observation or identified issues

#### Potential Improvements:

- Collision Trends / Identified Issue – correctable high collision types such as rear-end collisions and sideswipe collisions. As well as issues identified from site observation such as lack of cycling facilities and inadequate street lighting
- Potential Countermeasure – improvements to address specific issue, which are categorized into short-, medium-, and long-term phases

### 6.3 Further Considerations

With the suggested city-wide and site-specific countermeasures, the City of New Westminster could be able to take actions to prioritize implementing the recommended safety improvements based on the City's Capital Program and available funding.

For future potential safety study after this project, although it is not in the study scope, ISL would welcome the opportunity to support the next stage of Road Safety Plan with the followings:

- Collision Saving Identification
- Conceptual Design
- Cost Estimate Analysis
- Safety Cost-Benefit Analysis

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