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Memo

To:	Matthew Brown, Manager of Transportation Services, City of Courtenay Deva Muthukumaran, EIT, Transportation Technologist, Operational Services, City of Courtenay	From:	Stanley Li, M.Sc., P.Eng., PTOE, Senior Transportation Engineer Chao Qi, M.Sc., M.Eng., EIT, Transportation Planner
Project/File:	City of Courtenay Fitzgerald Avenue Crosswalk Planning Project – Draft Memorandum Ver.02 Project No.:132800172 – Task 8	Date:	April 10, 2025

1 Introduction

1.1 Study Background

Fitzgerald Avenue is a collector road in the center of Courtenay. The study area, spanning from Cumberland Road to 14th Street, is near Courtenay's downtown core. This study typically examines crosswalks along Fitzgerald Avenue between Cumberland Road and 14th Street, specifically at the following locations:

- Fitzgerald Avenue & Cumberland Road/8th Street
- Fitzgerald Avenue & 10th Street
- Fitzgerald Avenue & 11th Street
- Fitzgerald Avenue & 12th Street
- Fitzgerald Avenue & 13th Street
- Fitzgerald Avenue & 14th Street

It has been identified that these crosswalks are spaced too closely together, leading to inefficiencies and redundancy. The study aims to optimize crosswalk locations to enhance pedestrian safety, accessibility, and traffic flow. Key objectives include identifying high-use crosswalks for potential enhancements and determining whether less-utilized crosswalks should be removed or relocated.

Figure 1. Studied Crosswalk Locations

As shown in **Figure 1** above, Fitzgerald Avenue & Cumberland Road/8th Street is a signalized intersection, while the remaining five intersections are stop-controlled, with stop signs on the side streets.

- Fitzgerald Avenue & Cumberland Road/8th Street is a signalized intersection with marked crosswalks on all four legs. Pedestrian signals and phases are provided for all legs, along with pedestrian push buttons at each corner. Lighting is provided for all legs of the intersection, and curb ramps are installed at all corners for crosswalk accessibility. However, tactile surfaces are not currently applied to the curb ramps.

Figure 2. Crosswalk Layout at Fitzgerald Avenue & Cumberland Road/8th Street

- The crosswalk layouts at 10th to 12th Street follow a similar pattern, with a paved zebra crosswalk at the southeast-bound approach of Fitzgerald Avenue and two marked crosswalks along the side street. Lighting is provided along Fitzgerald Avenue to illuminate the zebra crosswalk, with pedestrian crossing signs installed at each end. Curb ramps are in place at all corners for crosswalk accessibility; however, tactile surfaces have not yet been applied.

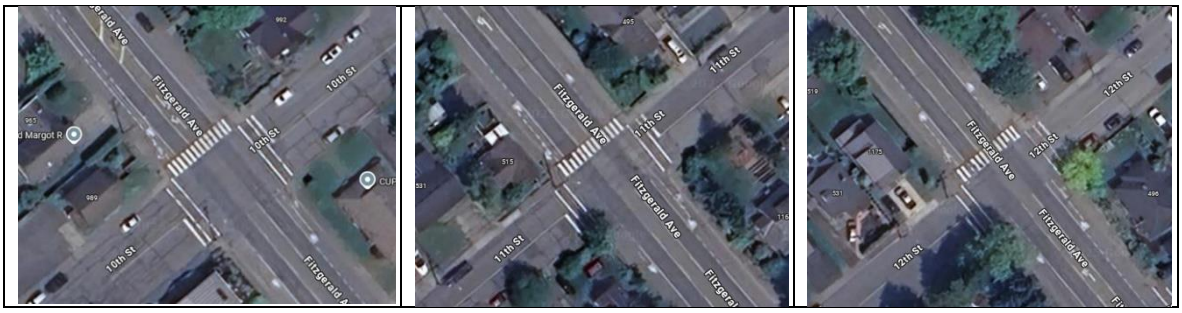

Figure 3. Crosswalk Layout at Fitzgerald Avenue & 10th, 11th and 12th Street

- The crosswalk layout at 14th Street differs slightly, featuring a paved zebra crosswalk at the northwest-bound approach of Fitzgerald Avenue, along with two marked crosswalks on the side street. The lighting, markings, signage, and accessibility features are similar to those at 10th to 12th Street.

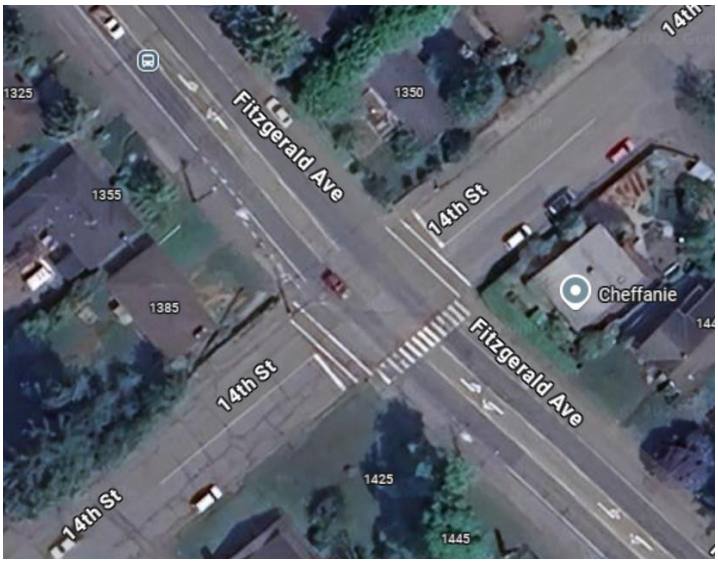

Figure 4. Crosswalk Layout at Fitzgerald Avenue & 14th Street

- There is no marked crosswalk on Fitzgerald Avenue at 13th Street. Two marked crosswalks are present on the intersecting side street.

Figure 5. Crosswalk Layout at Fitzgerald Avenue & 13th Street

Figure 6 below illustrates the distances between adjacent crosswalks on Fitzgerald Avenue along the studied road segment. It is evident that the crossings are located relatively close to one another, particularly the spacing between the crossings at 10th Street and 11th Street, as well as between 11th Street and 12th Street, which are less than 100 meters apart. This indicates a redundancy in crossing placement.

Figure 6. Distances between Adjacent Crosswalks on Fitzgerald Avenue from Cumberland Road to 14th Street

1.2 Study Objectives and Methodologies

Prioritization of crosswalk locations. This objective is to prioritize crosswalk locations for review and improvement while reducing redundancy. This involves identifying and evaluating the lowest-ranked crosswalks for potential removal to eliminate redundancy. This will be achieved using a Multi-Criteria Decision Analysis (MCDA) framework that considers pedestrian volumes, proximity to schools and popular school routes, nearby vulnerable road user (VRU) attractors & generators, and vehicle-pedestrian collision histories.

MCDA is a reliable tool that enables a comprehensive evaluation of multiple criteria simultaneously. It assigns different weights to each criterion based on its significance, relevance, and ability to distinguish between studied locations. By applying this approach, the study can effectively prioritize crosswalk locations and identify those of least importance for potential removal, addressing redundancy.

Assessment of prioritized crosswalk locations. This objective is to assess the current crosswalk facilities at the prioritized locations based on the Transportation Association of Canada's (TAC) Pedestrian Crossing Control Guide Third Edition (the Guide). The assessment will focus on evaluating the appropriateness and necessity of establishing crosswalks at specific locations using the Guide's Crossing Control Warrant. Additionally, it will determine whether the existing crosswalk facilities are sufficient to ensure smooth and safe pedestrian crossings. The

Guide's crossing treatment selection matrix will be utilized to examine the current crosswalk configurations and to recommend potential treatments and improvements.

Promoting an optimized crosswalk network for enhanced efficiency and safety. This involves assessing existing crossings, identifying opportunities for improvement, and ensuring that pedestrian infrastructure aligns with best practices and community needs. The study will provide suggestions on crosswalk improvement measures at prioritized locations, ensuring they meet safety standards and enhance visibility, accessibility, and compliance. By optimizing crosswalk placement and implementing appropriate enhancements, the study seeks to support safe and efficient pedestrian movements.

2 Data Collection and Analysis

2.1 Pedestrian Volume

Pedestrian data collection was conducted by the City between 10th Street and 14th Street. A seasonal adjustment factor of 1.3[1] was applied. The following graph (**Figure 7**) presents the peak-hour pedestrian volumes recorded at the study locations in Equivalent Adult Units (EAU).

[1] The seasonal variation in active transportation is evident across multiple studies, with increases ranging from 20% to 35% during the summer months. In Victoria, the CRD Household Travel Survey shows a 20% rise in walking and cycling from winter to summer (factor of 1.20), while Nanaimo experiences a more pronounced 35% increase (factor of 1.35) according to the Island Coastal Inter-Community Transportation Study. Similarly, Saanich's Active Transportation Plan reports a 30% increase (factor of 1.30). Given this range, using a factor of **1.3** is a justified and balanced assumption, aligning with Saanich's data and falling within the observed seasonal variations across these regions.

Figure 7. Peak Hour Pedestrian Volumes at Each Crossing

2.2 Traffic Volume and Speed

Traffic volume and speed data were obtained from City's records for the following locations:

- **Fitzgerald Avenue & 11th Street (southbound):** Data from January and February 2025 indicate an average 85th percentile speed of 53 km/h and an average daily traffic (ADT) of 6,540 vehicles (doubled one-way data to estimate two-way traffic). After applying a seasonal adjustment factor of 1.3[2], the adjusted ADT for the summer peak season is 8,500 vehicles.
- **Fitzgerald Avenue & 15th Street (northbound):** Data from January and February 2025 show an 85th percentile speed of 52 km/h and an average ADT of 4,000 vehicles (doubled one-way data to estimate two-way traffic). With a seasonal adjustment factor of 1.3, the summer peak season ADT is adjusted to 5,200 vehicles.
- **Fitzgerald Avenue at the 1400 Block (near 14th Street, southbound):** Data from July to September 2021 recorded an 85th percentile speed of 55 km/h and an average ADT of

[2] For adjusting Courtenay's winter vehicle traffic volumes to summer levels, a seasonal adjustment factor of 1.3, indicating a 30% increase, is proposed. This factor draws on traffic patterns from other Vancouver Island cities like Victoria and Nanaimo. In Victoria, summer traffic on Highway 1 and local roads rises by 20–35% over winter, fueled by tourists visiting the Inner Harbour and regional attractions, as reflected in provincial and municipal counts. Similarly, Nanaimo experiences a 25–40% increase in summer volumes on Highway 19, driven by ferry traffic and travel to coastal destinations, according to BC Ministry of Transportation data

8,000 vehicles doubled one-way data to estimate two-way traffic). Incorporating a seasonal adjustment factor of 1.3 and an annual growth rate of 2.4%[3], consistent with the Courtenay Transportation Master Plan[4], the projected ADT for the 2025 summer peak season is approximately 8,700 vehicles.

2.3 Pedestrian Collision Data

Pedestrian collision data is retrieved from ICBC pedestrian collision dataset from 2019 to 2023[5]. The data has been collected and mapped as can be seen in **Figure 8** below.

Figure 8. Map of the Pedestrian Collisions (2019-2023) near the Studied Crosswalks

3 Multi-Criteria Decision Analysis (MCDA)

An MCDA framework has been developed to prioritize the importance and necessity of installing crossing facilities at various locations. The analysis focuses on existing crossings at 10th Street, 11th Street, 12th Street, 13th Street, and 14th Street.

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[3] This growth rate is based on the traffic study for the City of Courtenay's Lerwick Road Lead Pedestrian Interval Study and aligns with the Courtenay Transportation Master Plan.

[4] courtenay.ca/assets/City~Hall/Project~Gallery/2018~Master~Transportation~Plan/2019-09-30 Connecting Courtenay - Transportation Master Plan FINAL.pdf

[5] BC - Crashes involving Pedestrians- | Tableau Public

It is worth noting that the crosswalk at Fitzgerald Avenue & Cumberland Road/8th Street is excluded in the MCDA analysis, as this is a signalized intersection where pedestrian crossings are already well-protected by pedestrian signals and marked crosswalks.

This MCDA framework evaluates key factors influencing pedestrian safety and accessibility at crosswalks. For the studied Fitzgerald Avenue segment in Courtenay, the criteria have been specifically considered include utilization, popular routes to school, VRU proximity and pedestrian collision history.

Traffic volume and speed are not considered in the MCDA analysis. While important factors, the studied crosswalk locations are relatively close to each other, making significant differences in speed and vehicle data unlikely. This is further supported by traffic data provided by the City.

3.1 Utilization Analysis (assigned weight 30%)

This criterion assesses the anticipated pedestrian traffic at a specific crossing. High pedestrian usage indicates a greater need for safe crossing facilities to accommodate demand. Prioritizing crossings with higher utilization and aligned with pedestrian desire lines ensures that resources are allocated where they will have the most impact on pedestrian movement and safety.

Based on the collected pedestrian data, the Fitzgerald Avenue crosswalk at 10th Street records the highest peak-hour pedestrian volume, with 34 EAU, followed by the crosswalk at 14th Street with 16 EAU. In contrast, the crosswalks at 11th Street and 12th Street exhibit significantly lower peak-hour volumes, at 8 EAU and 5 EAU respectively, suggesting reduced utilization. In addition, all pedestrians crossing Fitzgerald Avenue at 13th Street are jaywalking due to the absence of a designated crosswalk.

Table 1. Peak Hour Pedestrian Volume in EAU at Studied Crosswalks

Rank	Locations	Peak Hour Pedestrian Volume in EAU
1	Fitzgerald Avenue & 10th Street	34
2	Fitzgerald Avenue & 14th Street	16
3	Fitzgerald Avenue & 11th Street	8
4	Fitzgerald Avenue & 12th Street	5
5	Fitzgerald Avenue & 13th Street	4 (jaywalking)

3.2 Popular Routes to School (assigned weight 20%)

Ensuring safe pathways for students traveling to and from school is paramount. Identifying and prioritizing crosswalks along school routes can protect younger pedestrians. **Figure 9** below illustrates the optimal routes to École Puntledge Park Elementary School, located near the studied road segment. Notably, the crosswalk at Fitzgerald Avenue & 11th Street aligns with a designated school route, potentially warranting higher priority for safety considerations.

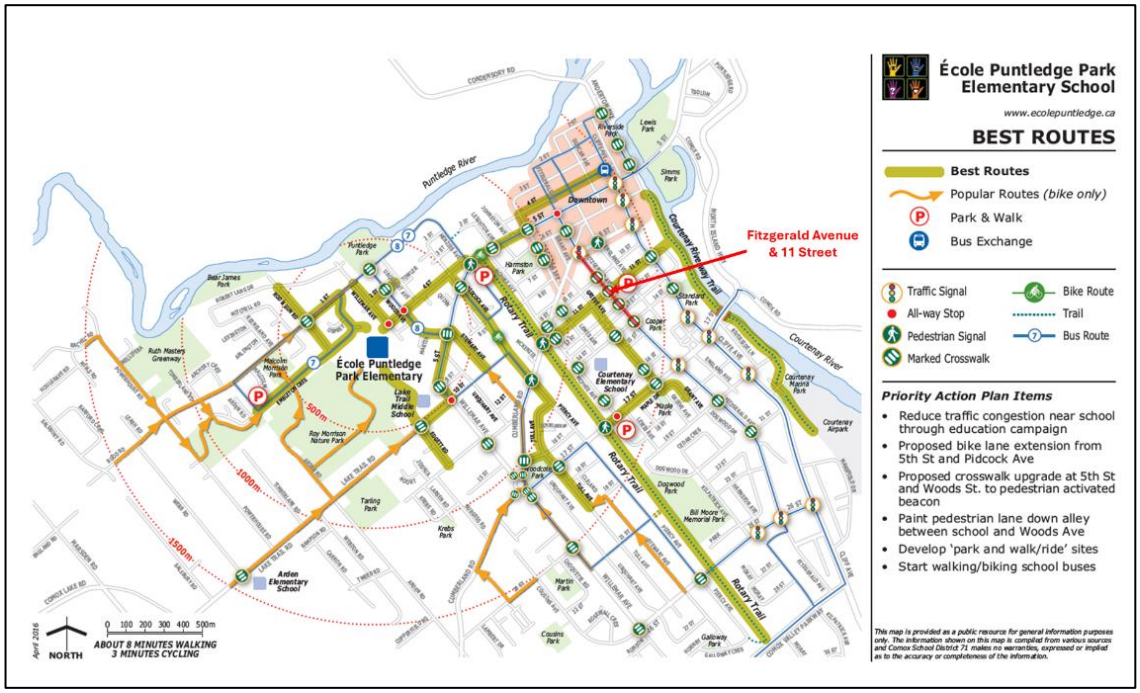


Figure 9. Best Route to School - École Puntledge Park Elementary

In addition, while Courtenay Elementary School, which is closer to the study area, does not have an official Safe Route to School Map, it is likely that 14th Street, 16th Street, Grieve Avenue, and McPhee Avenue serve as key safe or popular routes to the school. The crosswalk at Fitzgerald Avenue & 14th Street is likely the most frequently used crossing for accessing Courtenay Elementary, given its proximity to this school. The following **Figure 10** illustrates the geographic relationship between the crossing at 14th Street and Courtenay Elementary School. The red lines indicate potential popular walking routes for students connecting the school and this crossing.

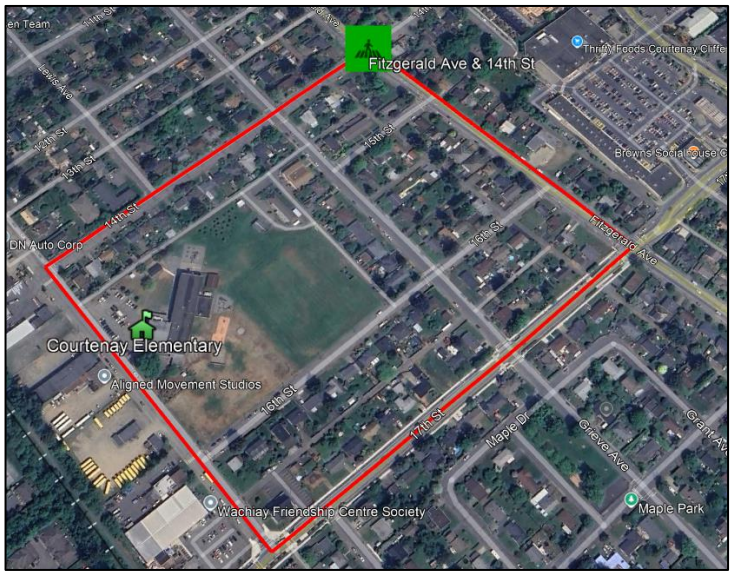


Figure 10. Popular Route to Courtenay Elementary School from Fitzgerald Avenue & 14th Street

The other crossing locations, i.e., those at 13th Street, 12th Street, and 10th Street are not typically part of the most popular and safest route to the school. However, they are relatively close to the routes mentioned above. Under this criterion, their ranking is determined by their proximity to the crossings at popular school routes - 11th Street or 14th Street, with 13th Street ranked highest, followed by 12th Street and then 10th Street.

Table 2. Proximity of Studied Crosswalks to Key School Routes

Rank	Locations	Popular routes to school
1	Fitzgerald Avenue & 11th Street	Along one of the popular school routes
1	Fitzgerald Avenue & 14th Street	
3	Fitzgerald Avenue & 13th Street	Their ranking is determined by their proximity to the crossings at popular school routes - 11th Street or 14th Street
4	Fitzgerald Avenue & 12th Street	
5	Fitzgerald Avenue & 10th Street	

3.3 VRU Proximity (assigned weight 20%)

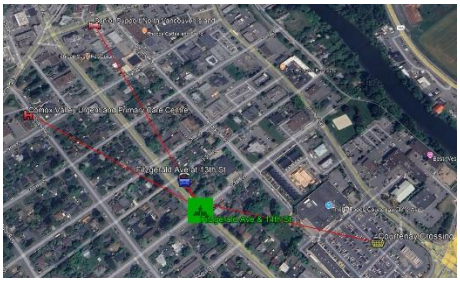
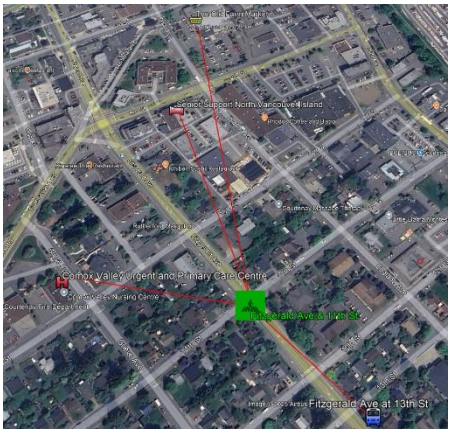
This criterion considers the proximity of crosswalk locations to pedestrian attractors or generators. Areas near these attractors typically experience higher pedestrian activity, including children, elderly individuals, and others who may be more vulnerable. Prioritizing crosswalks near these sites enhances accessibility and safety for all users.

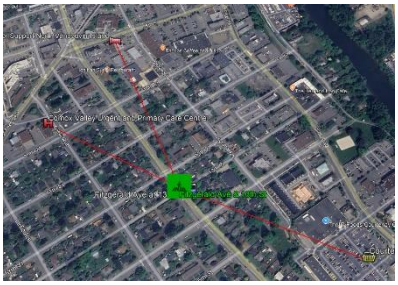
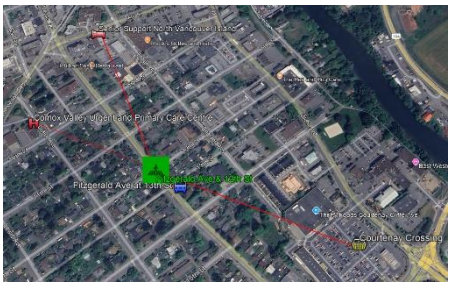
Considering the land use conditions surrounding the study area, the following attractors have been included in the analysis:

- Bus Stops – Fitzgerald Avenue at 13th Street and 8th Street
- Shopping Plaza/Mall – Courtenay Crossing and Old Farm Market
- Senior Service Centre - Senior Support North Vancouver Island
- Community Health Centre – Comox Valley Urgent and Primary Care Centre
- It is important to note that, as schools are already an independent criterion in the MCDA framework, proximity to schools is not included in the VRU Proximity criterion to avoid redundancy.

Table 3 below ranks the studied crosswalks by their proximity to the nearest VRU center of each facility type and specifies the corresponding distances.

Table 3. Geographic Distances from Crosswalks to the nearest VRU Centers

Rank	Location	Geographic Distances to the nearest VRU Centers	
1	Fitzgerald Avenue & 10th Street	• Distance to Old Farm Market: 296 meters. • Distance to Fitzgerald Avenue at 8th Street Bus Stop: 116 meters. • Distance to Senior Support North Vancouver Island: 156 meters. • Distance to – Comox Valley Urgent and Primary Care Centre: 131 meters. • **The average distance to a VRU center is 170 meters.**	
2	Fitzgerald Avenue & 14th Street	• Distance to Courtenay Crossing: 294 meters. • Distance to Fitzgerald Avenue at 13th Street Bus Stop: 53 meters. • Distance to Senior Support North Vancouver Island: 443 meters. • Distance to – Comox Valley Urgent and Primary Care Centre: 183 meters. • **The average distance to a VRU center is 240 meters.**	
3	Fitzgerald Avenue & 11th Street	• Distance to Old Farm Market: 387 meters. • Distance to Fitzgerald Avenue at 13th Street Bus Stop: 149 meters. • Distance to Senior Support North Vancouver Island: 249 meters. • Distance to Comox Valley Urgent and Primary Care Centre: 259 meters • **The average distance to a VRU center is 260 meters.**	

3	Fitzgerald Avenue & 13th Street	• Distance to Courtenay Crossing: 356 meters. • Distance to Fitzgerald Avenue at 13th Street Bus Stop: 26 meters. • Distance to Senior Support North Vancouver Island: 367 meters. • Distance to – Comox Valley Urgent and Primary Care Centre: 289 meters • **The average distance to a VRU center is 260 meters.**	
5	Fitzgerald Avenue & 12th Street	• Distance to Courtenay Crossing: 389 meters. • Distance to Fitzgerald Avenue at 13th Street Bus Stop: 60 meters. • Distance to Senior Support North Vancouver Island: 347 meters. • Distance to – Comox Valley Urgent and Primary Care Centre: 364 meters • **The average distance to a VRU center is 290 meters.**	

3.4 Pedestrian Collision History (assigned weight 30%)

This criterion prioritizes crosswalks with safety concerns for improvement. ICBC pedestrian collision data from 2019 to 2023 has been analyzed to evaluate and rank each crossing location based on its pedestrian collision history.

Collision(s) occurred at a location provide a clear indication of the road safety risks associated with that area. During the 2019-2023 period, pedestrian collisions were recorded at the exact crosswalk locations on 10th Street and 14th Street, highlighting significant safety concerns. In contrast, no pedestrian collisions were reported at 11th Street, 12th Street or 13th Street, despite their proximity to the higher-risk locations, as a result, their prioritization is ranked lower. The table below presents pedestrian collision statistics for all studied crossing locations.

Table 4. Pedestrian Collision History (2019-2023) of the Studied Crosswalks

Rank	Locations	Pedestrian Collision at the Location
1	Fitzgerald Avenue & 10th Street	1
1	Fitzgerald Avenue & 14th Street	1
3	Fitzgerald Avenue & 11th Street	0
3	Fitzgerald Avenue & 12th Street	0

Rank	Locations	Pedestrian Collision at the Location
3	Fitzgerald Avenue & 13th Street	0

3.5 Comprehensive Ranking and Prioritization

Table 5 below presents the comprehensive MCDA ranking of the studied crosswalk locations along Fitzgerald Avenue. The crosswalk at the intersection of Fitzgerald Avenue & 14th Street ranks highest, while the crosswalks at 10th and 11th Street follow in second and third positions. The crossing locations at 13th Street and 12th Street rank in the last two positions.

The crosswalk at 12th Street ranks last, with a noticeably low average ranking. This indicates that the necessity and prioritization for maintaining a crosswalk at this location are significantly lower compared to other crossing locations. **It is recommended to remove the crosswalk at 12th Street to reduce redundancy and enhance the overall efficiency of the crosswalk network**.

Table 5. Comprehensive Ranking of the Studied Crossing Locations along Fitzgerald Avenue

Comprehensive Ranking	Crosswalk Location	Pedestrian Utilization Ranking (30%)	Safe Route to School Ranking (20%)	VRU Proximity Ranking (20%)	Pedestrian Collisions Ranking (30%)	**Average Ranking**
1	Fitzgerald Avenue & 14th Street	2	1	2	1	**1.50**
2	Fitzgerald Avenue & 10th Street	1	5	1	1	**1.80**
3	Fitzgerald Avenue & 11th Street	3	1	3	3	**2.60**
4	Fitzgerald Avenue & 13th Street	5	3	3	3	**2.70**
5	Fitzgerald Avenue & 12th Street	4	4	5	3	**3.90**

4 Crosswalk Treatment Review

4.1 Crossing Control Warrant Analysis

As discussed above, the warrant analysis will focus on the crossing locations at 10th Street, 11th Street, 13th Street, and 14th Street. The following outlines the result and rationale behind the crosswalk warrant analysis for each location.

- **10th Street (Warranted)**. A traffic signal is not necessary at this location. This crossing recorded the highest pedestrian volume during the PM peak hours, with 34 EAUs (adjusted by seasonal factors), significantly exceeding the 15 EAU threshold. The estimated peak season ADT also surpasses the 1,500 vehicles/day threshold. Although the distance to the crosswalk at 11th Street is 95 meters - slightly below the 100-meter

minimum spacing recommended by TAC's Guide - the location aligns with the pedestrian desire line. This is supported by the high pedestrian volume and its proximity to several pedestrian hubs. In conclusion, this location meets the warrant for pedestrian crossing control.

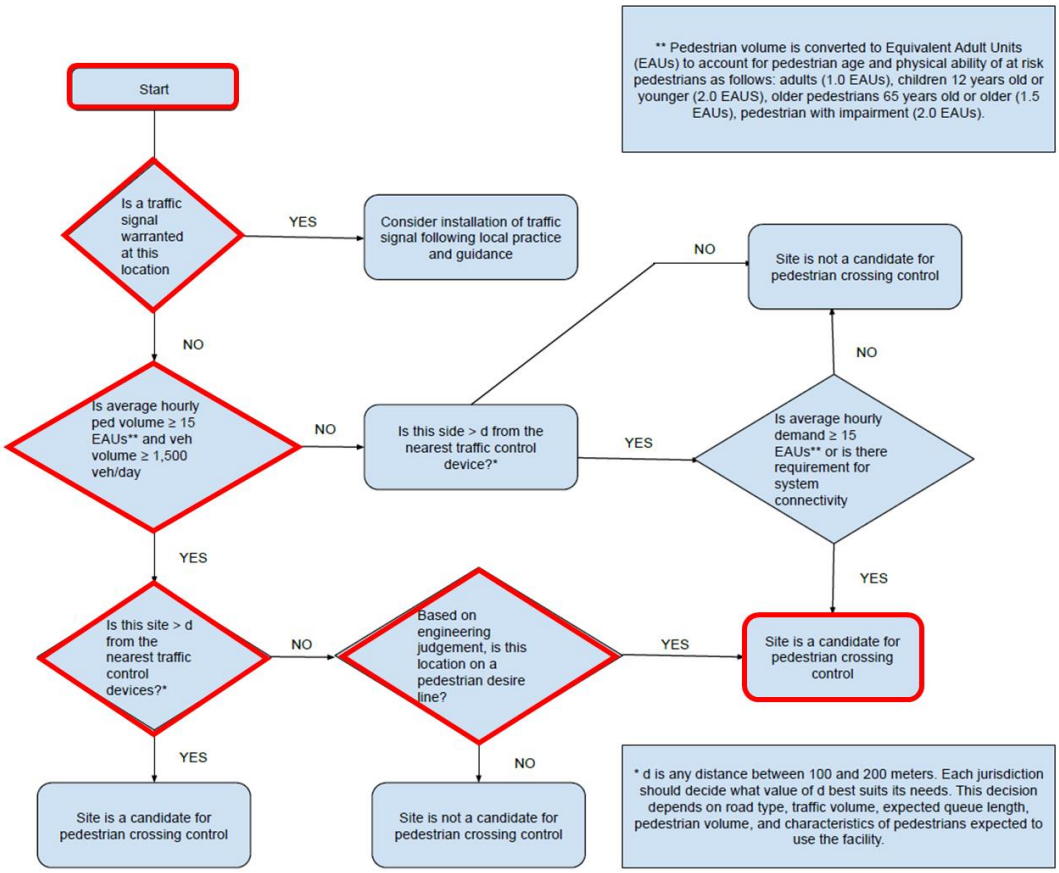


Figure 11. TAC Crosswalk Warrant for the Crossing at 10th Street

- **<u>11th Street (Not Warranted)</u>**. This location's vehicle volume exceeds the 1,500 vehicles/day threshold; however, the recorded pedestrian volume is low, remaining below the 15 EAU threshold. Additionally, the distance to the nearest crossing at 10th Street is below the 100-meter minimum spacing recommended by TAC's Guide. Therefore, this location is not a suitable candidate for pedestrian crossing control, and the existing crosswalk at this location may be considered for removal.

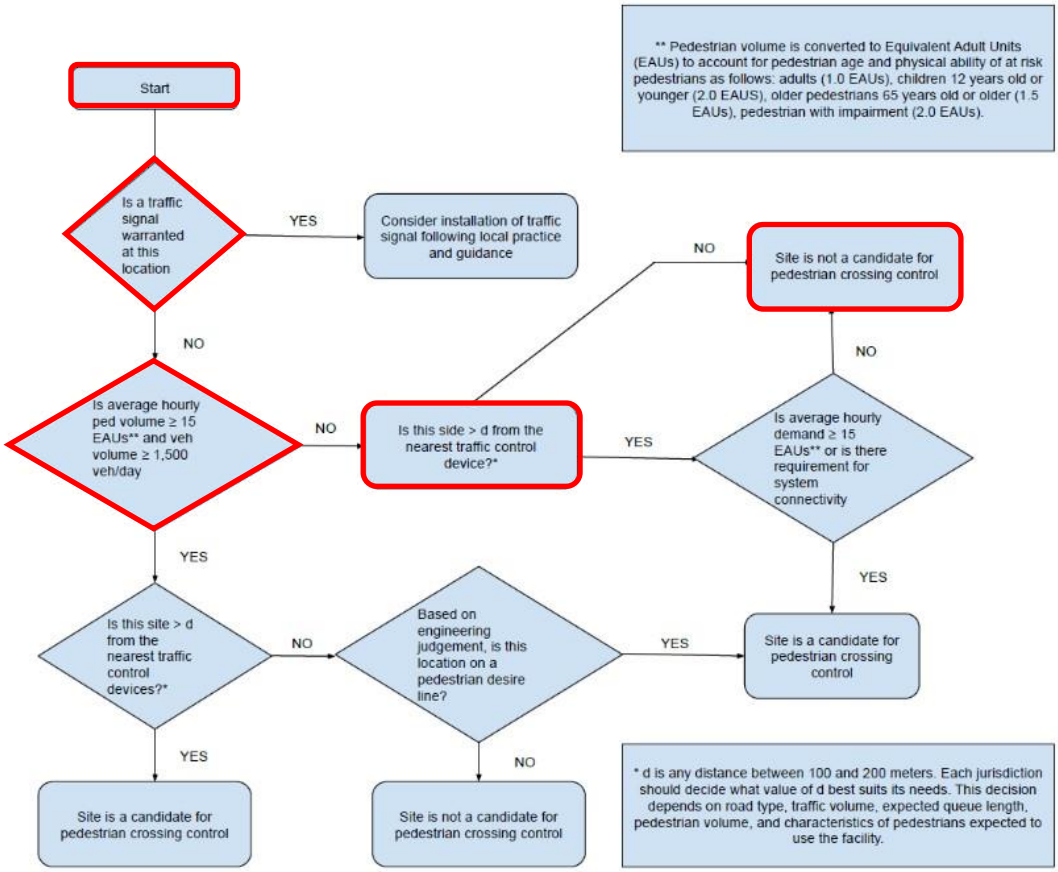


Figure 12. TAC Crosswalk Warrant for the Crossing at 11th Street

- **13th Street (Not Warranted)**. This location lacks a pedestrian crossing across Fitzgerald Avenue, with field observations recording a few instances of jaywalking. Traffic conditions are similar to those at nearby 11th Street. Given its proximity to both 12th Street and 14th Street (less than 100 meters), adding a crosswalk would be redundant and inefficient. Enhancing nearby crosswalks is expected to reduce jaywalking and encourage pedestrians to use designated crossings at other locations.

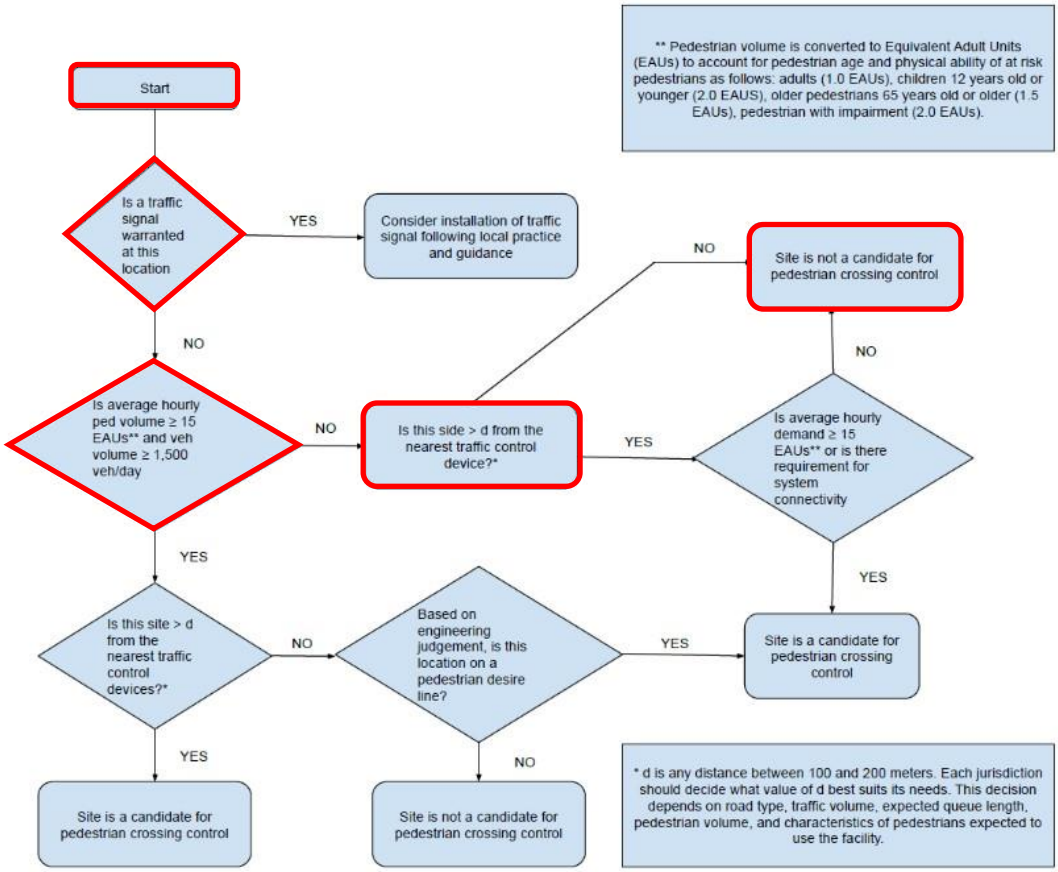


Figure 13. TAC Crosswalk Warrant for the Crossing at 13th Street

- **14th Street (Warranted)**. This location meets both the vehicle and pedestrian volume thresholds recommended by TAC's Guide. Additionally, the distance to the nearest traffic control devices is approximately 300 meters from the signalized intersection at 17th Street (assuming the crosswalks at 11th and 12th Streets are to be removed). Therefore, this site is a suitable candidate for pedestrian crossing control.

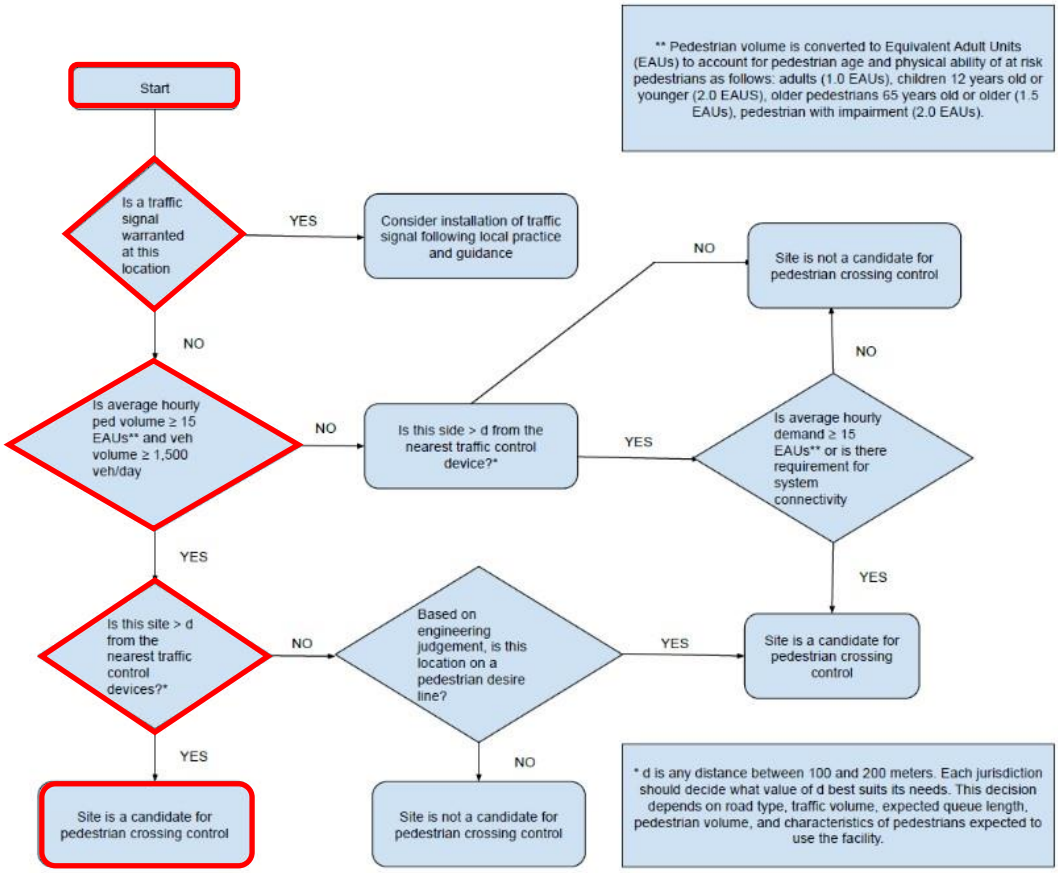


Figure 14. TAC Crosswalk Warrant for the Crossing at 14th Street

In summary, the crossing control warrant analysis confirms that **crosswalks at 10th and 14th Street on Fitzgerald Avenue are appropriate crossing locations, while the crossing locations at 12th and 13th Street do not meet the criteria for crossing treatments**.

4.2 Crossing Treatment Selection

When selecting the appropriate crossing treatment for the warranted locations, the TAC Guide's treatment selection system is used. This system categorizes crossing treatments into the following five hierarchical groups, ranging from simple solutions to more comprehensive and intensive options.

1. **Ground mounted systems (GM)** are the most basic of all treatment systems that rely on passive signs rather than active signs. (i.e., those with flashing beacons or any other type of active device).
2. **Enhanced ground mounted system (GM+)** are passive systems similar to the GM system. They are enhanced because they include zebra pavement markings as a required component and specifically require the practitioner to evaluate the use of desirable components to enhance the conspicuity to the crossing location. (e.g., overhead signs.)

3. **Rectangular rapid flashing beacons (RRFB)** are pedestrian activated treatment systems which consist of two rapidly and alternately flashing rectangular amber beacons mounted above side-mounted pedestrian signs.
4. **Overhead flashing beacon system (OF)** or special crosswalk are a pedestrian activated treatment system which consists of internally illuminated overhead mounted signs with alternating amber flashing beacons and down lighting.
5. **Traffic signals (TS)** provide designated crossing opportunities for pedestrians and assign the right-of-way between conflicting streams of traffic. They may be pedestrian signals or full traffic signals.

Based on the Warrant Analysis results, the crosswalks on Fitzgerald Avenue at 10th and 14th Street qualify for crossing control treatment and will proceed to treatment selection. Given the characteristics of these locations, **RRFBs are recommended as the most appropriate treatment** (see **Table 6** below).

- Both locations have a lane configuration of one lane per direction with a two-way left-turn lane in the middle.
- The posted speed limit is 50 km/h.
- The current average daily traffic (ADT) near 10th and 14th Street is approximately 8,500 - 8,700, which is close to the 9,000 ADT threshold for RRFB implementation. Considering future traffic growth, ADT is expected to exceed this threshold within 2–3 years.

Table 6. TAC Pedestrian Crossing Treatment Selection Matrix

Average Daily Traffic	Speed Limit** (km/h)	Total Number of Lanes (includes all types of lanes*)				
		1 or 2 lanes	3 lanes (two-way)	3 lanes (one-way)	2 or 3 lanes/direction w/raised refuge	2 lanes/direction w/o raised refuge
1,500<ADT≤4,500	≤50	GM	GM	GM	GM	GM+
	60	GM+	GM+	OF	RRFB or OF***	RRFB
	70	RRFB	RRFB	OF	OF	OF
4,500<ADT≤9,000	≤50	GM	GM	GM	GM	RRFB
	60	GM+	GM+	OF	RRFB or OF***	OF
	70	RRFB	OF	OF	OF	TS
9,000<ADT≤12,000	≤50	GM	RRFB	OF	RRFB or OF***	OF
	60	RRFB	RRFB	OF	RRFB or OF***	TS
	70	OF	OF	OF	TS	TS
12,000<ADT≤15,000	≤50	RRFB	RRFB	OF	RRFB or OF***	OF
	60	RRFB	OF	OF	RRFB or OF***	TS
	70	OF	TS	TS	TS	TS
>15,000	≤50	RRFB	OF	OF	RRFB or OF***	TS
	60	RRFB	TS	TS	TS	TS
	70	OF	TS	TS	TS	TS

* The total number of lanes is representative of pedestrian-exposed crossing distance. The following can help determine the applicable number of lanes for a given roadway:
- Travel lanes, two-way left turn lanes, other turning lanes, and part time parking lanes should each be considered as one lane.
- Full time parking lanes on one or both sides of the roadway should be considered as one lane. Curb extensions may be constructed to reduce the total crossing distance and hence, the number of lanes.
- Engineering judgment based on local conditions should be used to determine the lane equivalent associated with bicycle lanes.

** At roundabouts, the maximum design speed of entering or existing vehicles is often lower than the approaching roadway speed and can be used in place of the roadway speed limit.
*** If three lanes per direction use OF.

Additional notes:
Treatment systems are hierarchical (GM → GM+ → RRFB → OF → TS). Higher order treatment systems may be substituted for lower order treatment systems. The rationale for substituting higher order treatment systems should be consistent throughout the jurisdiction. Remain consistent in application of DESIRABLE components of the GM+ system as best as possible.
Raised refuge may be a pedestrian refuge island or raised median. Raised refuge should be a minimum of 2.4 metres wide to accommodate groups of pedestrians, bicycles, and mobility aids such as wheelchairs and scooters.
A TS treatment system should be selected: (1) for cross-sections with greater than six lanes where a raised refuge is present: (2) for cross sections with greater than four lanes where no raised refuge is present: and (3) for speeds greater than 70 km/h.
Always ensure adequate sight distance at the site as per the TAC Geometric Design Guide for Canadian Roads, and if it is insufficient, create it by applying available tools.
A crossing location with a very wide (7m or more) pedestrian refuge area between opposing directions of traffic may be considered to divide the crossing into two independent sections and may be treated as two separate crosswalks. This may occur at locations with a wide raised refuge or offset crosswalk.

Table 7 below outlines the key components required for a complete RRFB installation on the roadway.

Table 7. List of RRFB Components for Installation

Recommended Components	Desirable Components	Optional Components
General Case	General Case	General Case
• RRFB and side-mounted signs (RA-4); mounted back to back on both sides of an undivided roadway or one on the right side and one on the median for a roadway with raised refuge.  • Zebra crosswalk marking. • Pedestrian pushbutton with sign (ID-21) at each crossing beginning.  • Advanced warning sign (WC-2) where visibility is limited.  • Stopping prohibition for a minimum of 15 m on each approach to the crossing, and 10 m following the crossing.  • Passing restrictions on single lane approaches. • Lane change prohibition on multiple lane approaches	• Advance Yield to Pedestrians Line on multiple lane approaches. • Yield Here to Pedestrians Sign on multiple lane approaches.  • Raised refuge island for road cross-sections with more than two lanes and two-directional traffic. • Stopping prohibition for a minimum of 30 m on each approach to the crossing and 15 m following the crossing. • Active indicator on pushbutton to confirm to pedestrians the RRFB is in operation.	• Crossing guards. • Offset crosswalk arrangement for crossings with raised refuge island. • Curb extensions for road cross-sections with full-time on-street parking. • Curb corner radius reduction. • Raised crosswalk. • Additional overhead mounted signs (RA-4) on both sides of the road.

Recommended Components	Desirable Components	Optional Components
General Case	General Case	General Case
using solid white lines (recommended length of solid white line depends on approach speed- use 30 m for 50 km/h speed limit)		

5 Recommendations and Optimization Plan

Based on the findings from the analysis, several recommendations have been identified to improve pedestrian safety, optimize crosswalk efficiency, and enhance infrastructure along Fitzgerald Avenue. These recommendations include the removal of redundant crosswalks, upgrading priority crosswalks with enhanced safety measures, improving lighting conditions, and introducing accessibility enhancements to create a safer and more inclusive pedestrian network.

5.1 Removal of Redundant Crosswalks

Based on the analysis results of this study, crosswalks at 11th Street and 12th Street are unnecessary or redundant. The analysis found that 12th Street ranked the last in the MCDA analysis, while 11th Street did not meet the criteria in the crosswalk warrant analysis. Additionally, 13th Street also failed to meet the warrant analysis requirements for installing a new crosswalk. Removing the existing crosswalks at 11th and 12th Streets will help reduce redundancy, improve traffic flow, and encourage pedestrians to use safer, better-equipped crossings at 10th Street and 14th Street.

5.2 RRFB Crosswalk Upgrades for Enhanced Safety

The crosswalks at 10th Street and 14th Street have been identified as priority locations for pedestrian safety improvements. Both crossings experience higher pedestrian activity and have documented pedestrian collisions within the study period (2019-2023). To improve pedestrian visibility and reduce the risk of collisions, it is recommended that these crosswalks be upgraded from standard zebra crosswalks with pedestrian crossing signs to RRFBs. RRFBs provide high visibility flashing lights that activate when pedestrians cross, increasing driver awareness and compliance with yielding. RRFBs can offer a cost-effective yet highly effective solution to enhance pedestrian safety and driver awareness at these locations.

5.3 Lighting Improvements for Better Visibility in Low-Light Conditions

A public inquiry was recently submitted to the City regarding the 14th Street crosswalk, highlighting concerns about inadequate lighting at this location. The individual reported nearly hitting a pedestrian due to poor visibility, emphasizing the need for lighting improvements. To address this issue, a lighting assessment is recommended for both 10th Street and 14th Street

crosswalks to evaluate visibility during nighttime and adverse weather conditions. If deficiencies are identified, the City may need to consider installing additional streetlights, upgrading existing lighting to brighter LED fixtures, or repositioning lighting poles to ensure adequate illumination of pedestrian crossings.

In addition to improving street lighting, the City could explore the use of high-visibility, flexible zebra crosswalk paint, which is designed to reflect light more effectively in low-light conditions. This type of paint enhances visibility, particularly when headlights illuminate the crossing at night or during adverse weather conditions. By incorporating both improved lighting and high-contrast reflective crosswalk markings, pedestrian visibility and overall safety is expected to be enhanced.

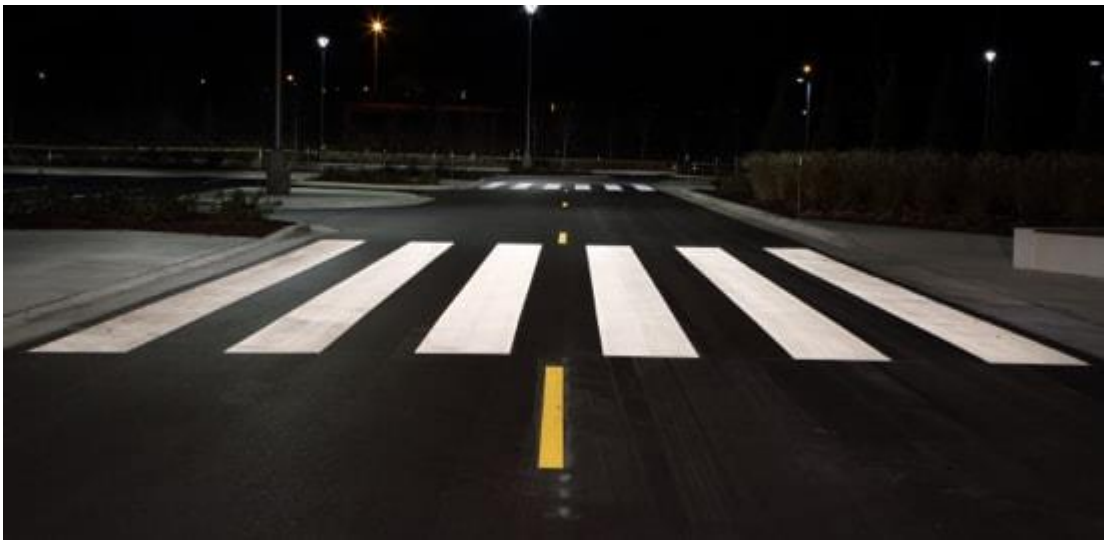


Figure 15. Example of High Visibility Pavement for Crosswalk Treatment[6]

5.4 Enhancing Accessible Design for Equity and Inclusion

To improve accessibility and equity for all pedestrians, including those with visual impairments and mobility challenges, it is recommended to install tactile paving at the curb ramps of the studied crosswalks. Tactile paving consists of textured ground surface indicators that provide guidance for individuals with visual impairments, helping them detect the crosswalk's boundary and direction. Additionally, the curb ramps may need to be reviewed to ensure they meet universal design standards, with proper slope and width to accommodate wheelchairs, strollers, and mobility aids. By enhancing accessibility features, these crosswalks will become safer and more inclusive, ensuring that pedestrians of all abilities can navigate Fitzgerald Avenue comfortably and independently.

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[6] High Visibility Intersections | Urban Mobility | 3M Canada

Figure 16. Example of Tactile Pavement for Crosswalk Ramp[7]

5.5 Adjusting Popular Routes to School

As discussed in **Section 3.2**, the crosswalk at 11th Street is located along a popular route to school, connecting the Courtenay Riverway Trail with Fitzgerald Avenue, Grieve Avenue, and the Rotary Trail to the west. Following its removal, it is recommended that the route be adjusted to 14th Street, allowing pedestrians to utilize the upgraded and safer crossing at 14th Street to connect to Grieve Avenue, as shown in **Figure 17** below.

[7] Truncated domes - Tactile paving - Wikipedia

Figure 17. Adjusted Popular Route to School

5.6 Discouraging Jaywalking

To discourage jaywalking following the removal of crosswalks at 11th and 12th Street while encouraging using crosswalks at 10th and 14th Street, a combination of physical and educational measures is recommended. Installing clear and visible wayfinding signage can help direct pedestrians to the nearest designated crossings, ensuring they are aware of safer alternatives. Enhancing pedestrian infrastructure at 10th and 14th Street is also expected to improve safety and visibility, making these crossings more attractive and encouraging proper usage. Additionally, targeted public awareness campaigns, including outreach local communities, schools can reinforce the importance of using designated crosswalks.

6 High Level Implementation Plan

This section outlines a high-level phased approach for implementing the recommended crosswalk improvements along Fitzgerald Avenue. The implementation plan prioritizes safety enhancements while optimizing resources and minimizing disruptions to traffic and pedestrian movement.

6.1 Implementation Phases

Phase 1 - Removal of redundant crosswalks: This phase is to implement immediate safety enhancements and removal of redundant crosswalks.

- Remove redundant crosswalks at 11th Street and 12th Street to improve traffic flow and encourage pedestrian use of safer crossings at 10th Street and 14th Street.
- Update pedestrian and vehicle signage to align with the revised crosswalk plan.
- Conduct a lighting assessment at 10th and 14th Street crosswalks to determine the need for additional illumination. Upgrade street lighting at 10th and 14th Street based on the findings of the lighting assessment.
- Install high-visibility reflective pavement markings at prioritized crossings (10th and 14th Street) to enhance nighttime visibility.
- Coordinate with local schools and community stakeholders to inform them of crosswalk changes and adjustments to school routes.

Phase 2 – Installation of RRFB: This phase focuses on enhancing safety by improving the crosswalk with RRFB.

- Install RRFB components at 10th and 14th Street crosswalks to improve pedestrian visibility and driver compliance.
- Install tactile paving at crosswalk ramps to enhance accessibility for individuals with visual impairments.
- Conduct a public awareness campaign in coordination with local schools, businesses, and residents to educate pedestrians and drivers on the changes and benefits of the new crosswalk configurations.

Phase 3 – Monitoring and Evaluation: This phase is to ensure long-term safety and efficiency through monitoring and optimization

- Conduct post-implementation review(s) to assess pedestrian and vehicle compliance at upgraded crosswalks.
- Monitor pedestrian usage and collision or near misses at crosswalks and determine if further safety measures are required, e.g., curb extensions, pedestrian refuges, more advanced crosswalk treatments.
- Evaluate the impact of future roadway upgrades on pedestrian safety needs.

6.2 Roles and Responsibilities

The City of Courtenay may serve as the lead agency responsible for overseeing the planning, funding, and execution of the recommended crosswalk improvements to enhance pedestrian safety and accessibility. The Public Services Department may be tasked with carrying out the physical modifications at the studied crosswalk locations, including the removal of redundant crosswalks, the installation of new pavement markings, the updating of signage, and the deployment of RRFBs, etc.

Additionally, the City's Transportation Services team may play a key role in ensuring compliance with the updated crosswalk configurations. This could involve ongoing monitoring of pedestrian and driver behavior, assessing the effectiveness of the improvements, and implementing educational initiatives to inform the public about the changes. Outreach efforts, such as public awareness campaigns or targeted messaging, may help reinforce safe crossing practices and promote adherence to the revised crossing infrastructure.

6.3 Risk Management and Mitigation Strategies

Several challenges may arise during the implementation of crosswalk improvements. One key challenge is the potential for construction-related disruptions, which could affect both pedestrian movement and vehicle traffic. To minimize inconvenience, scheduling work during off-peak hours is recommended whenever feasible. Additionally, clearly marking and communicating temporary detours in advance can help ensure a smooth transition and maintain accessibility for all road users.

Another challenge is potential public resistance to crosswalk removals, particularly from residents concerned about pedestrian accessibility and safety. To address this, proactive communication and community engagement are essential. Strategies such as public meetings, informational materials, and direct outreach to stakeholders can help explain the rationale behind the changes, emphasizing the overall safety benefits and alternative pedestrian routes. Actively gathering feedback and addressing concerns can foster public trust, encourage collaboration, and reduce opposition to the proposed improvements.

7 Conclusions

The Fitzgerald Avenue Crosswalk Planning and Optimization study provides a data-driven approach to improving pedestrian safety, accessibility, and overall traffic efficiency. By assessing crosswalk utilization, school route connectivity, pedestrian collision history, and proximity to VRU attractors, the study identifies key locations for crosswalk enhancements and recommends the removal of redundant crossings to streamline pedestrian movement.

The proposed removal of crosswalks at 11th and 12th Streets aims to reduce redundancy while prioritizing pedestrian crossings at 10th and 14th Streets, where higher pedestrian volumes and safety concerns warrant improvements. Installing RRFBs, enhancing lighting, and incorporating

accessibility features such as tactile paving will help create a safer, more inclusive pedestrian environment.

To ensure a successful transition, the implementation plan outlines a phased approach, balancing infrastructure upgrades with community engagement and education. Proactive communication, clear wayfinding signage, and public awareness initiatives will help address concerns about crosswalk removals while discouraging unsafe crossing behaviors.

With ongoing monitoring and adaptive strategies, the City of Courtenay can create a safer, more efficient pedestrian network along Fitzgerald Avenue. By prioritizing well-utilized crossings, implementing targeted safety enhancements, and promoting compliance through education and enforcement, these improvements will help foster a more walkable and accessible corridor for residents and visitors.