MEMORANDUM

URBAN SYSTEMS

DATE	May 29, 2025	FROM	Dan Casey, RPP, MCIP, Transportation Planner Ming Xia, P.Eng., PTOE, Transportation Engineer
TO	Matthew Brown, P.Eng., Manager of Transportation	FILE	3222.0107.01
		SUBJECT	Cliffe Avenue / 5th Street Intersection Review

1.0 INTRODUCTION

The Cliffe Avenue / 5th Street intersection is a key intersection within the City of Courtenay's transportation network. It is directly adjacent Downtown Courtenay and facilitates significant daily travel demand between South Courtenay, Downtown Courtenay and East Courtenay via the 5th Street Bridge.

The City is seeking to identify opportunities to improve pedestrian crossing opportunities at this intersection. This would help support safe and efficient pedestrian crossing, including supporting pedestrian objectives in the downtown, while balancing any adverse impacts on intersection traffic operations and understanding the broader benefits such changes could help support.

The following memorandum summarizes the review of pedestrian crossing enhancement opportunities, generally addressing the following items:

- An overview of the intersection including location, key parameters and current pedestrian opportunities;
- Identification of potential pedestrian crossing enhancement opportunities;
- Review of anticipated change in traffic operational performance resulting from each crossing enhancement option;
- Review of signal infrastructure, ability to facilitate crossing enhancement opportunities, and modifications required;
- Review of broader impacts and opportunities associated with each crossings enhancement option; and
- Summary and recommendations for crossing enhancement opportunities.

2.0 INTERSECTION OVERVIEW

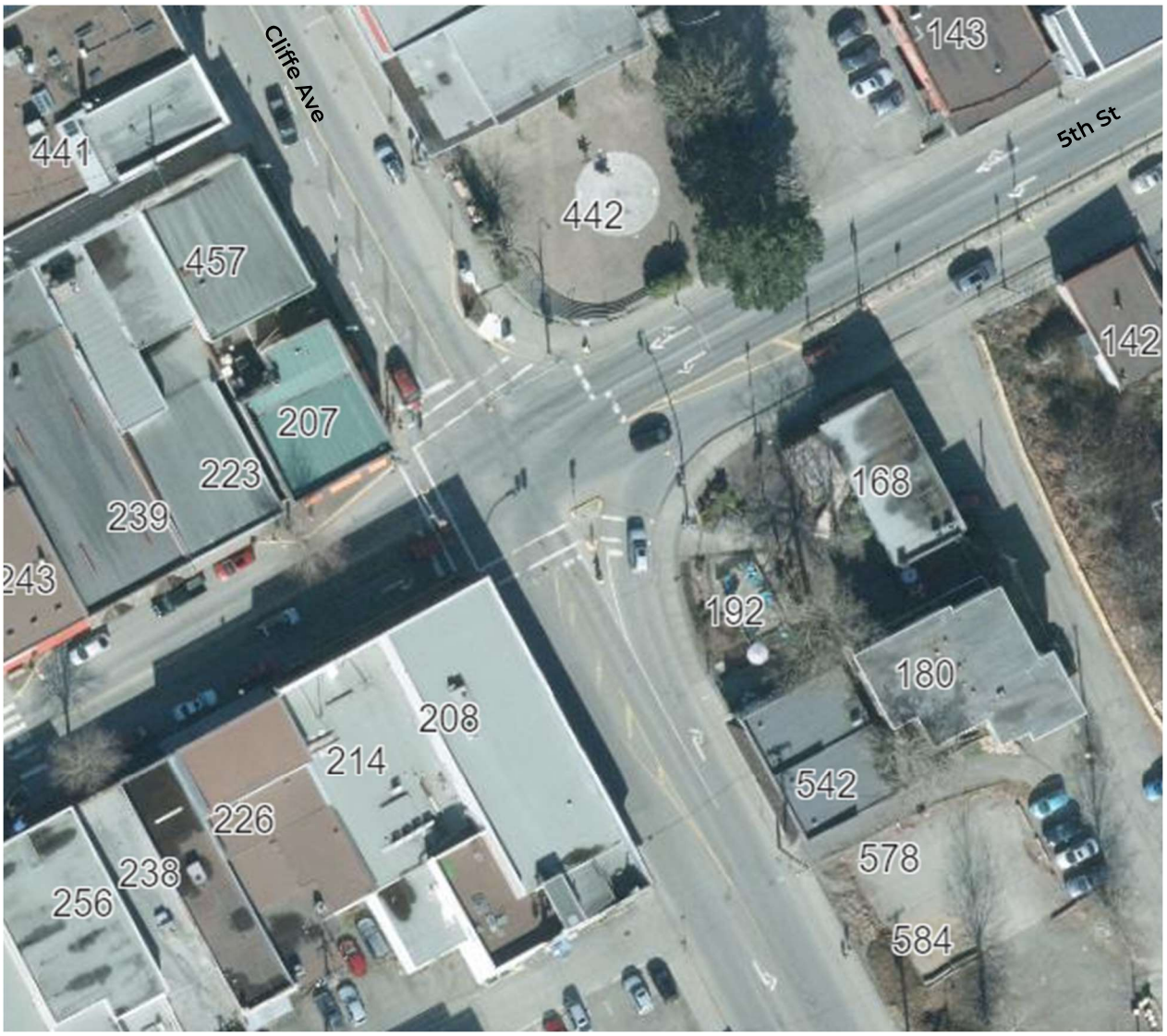
The review is focused on the Cliffe Avenue / 5th Street intersection. Refer to **Figure 1**. For this assignment, Cliffe Avenue is oriented north / south and 5th Street is oriented east / west. This intersection is set in an urban location immediately east of Downtown Courtenay and the western side of the 5th Street Bridge, one of two crossings of the Courtenay River connecting the eastern portion of Courtenay with Downtown Courtenay.

The Cliffe Avenue south leg and 5th Street east leg are designated as Arterial – Major corridors. Average daily traffic (ADT) volumes are approximately 15,000 vehicles per day (vpd) for Cliffe Avenue and 22,000 vpd for 5th Street. The high-volume northbound right-turn and westbound left-turn movements are supported by dedicated turn lanes and signal phases.

Traffic volumes are more modest on the Cliffe Avenue north leg and 5th Street west leg, both designated as Arterial – Minor streets. 5th Street west of Cliffe Avenue is the main street for Downtown Courtenay, with wide sidewalks and angled on-street parking.

The intersection includes pedestrian crossing on the south, west and north legs. The south leg crossing includes two stages due to the channelized northbound right-turn turn and dedicated signal phase. Pedestrian crossing is not facilitated on the intersection east leg (5th Street).

FIGURE 1. STUDY AREA



3.0 CROSSING IMPROVEMENT OPTIONS

3.1 OBJECTIVES

Pedestrian crossing enhancement opportunities have been identified to address the following objectives:

- Support more efficient pedestrian crossing, including reduced crossing time, less dwell time and more crossing opportunities;
- Support safer pedestrian crossing;
- Identify any broader benefits realized by pedestrian crossing improvements; and
- Mitigate adverse impacts created by pedestrian crossing improvements, including traffic delay (including transit and emergency services), capital cost associated with signal or civil infrastructure, and other impacts.

3.2 OPTIONS

The following are pedestrian crossing enhancement opportunities. Each is described below and is the basis for the technical study contained in the following sections.

Option 1. Pedestrian Scramble

A pedestrian scramble involves a dedicated signal phase that temporarily stops all traffic (vehicles, cyclists) and allows pedestrians to cross in all directions. A pedestrian scramble is typically most applicable in locations with high pedestrian volumes, particularly with demand for two-stage / diagonal crossing, and where vehicle traffic volumes are low or of reduced importance relative to pedestrian accommodation.

Pedestrian scrambles are uncommon. Examples on Vancouver Island include the Government Street / Wharf Street intersection in Victoria[1] and previously trialed scramble at the Canada Avenue / Ingram Street intersection in Duncan.

Option 2. Leading Pedestrian Interval (LPI)

A leading pedestrian interval (LPI) is created through signal timing that permits a pedestrian to begin crossing prior to green time being granted to conflicting vehicle turn movements, allowing pedestrians to enter the crosswalk and become more visible to motorists. It is assumed this would be accommodated by audible signal supports to aid those with vision loss. A leading interval of 3-7 seconds in advance of vehicle movements is most commonly pursued.

[1] Video example of the Victoria scramble example available at: www.youtube.com/watch?vr3xzfkPdlwk

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Option 3. No Right-Turn-on-Red (RTOR)

Turning right on a red signal after stopping and yielding is currently permitted along all four legs of the intersection. Studies have shown significant reductions in accidents with vulnerable road users (e.g., people walking and cycling) when RTOR has been prohibited. This allows pedestrians to cross without conflict with right-turning vehicles.

Option 4. East Leg Crossing

A fourth crossing opportunity may be added on the intersection east leg (5th Street). This would allow pedestrians to cross directly between the northeast (Sid Williams Theatre) and southeast (Cliffe & 5th Park) corners in a single crossing, while introducing conflict and delay for the dominant vehicle turn movements through the intersection (northbound right-turn, westbound left-turn). It is anticipated this would be facilitated via an expanded pedestrian refuge island on the southeast corner, while still allowing for uninterrupted channelized northbound right-turn movements.

Option 5. Northbound Right-Turn Channel Removal

The northbound right-turn channel could be removed to eliminate one of the intersection crossing legs. It is assumed that a dedicated right-turn lane (unchannelized) would be established directly adjacent the northbound through lane and that the current dedicated signal phase to facilitate northbound right-turn movements would remain. Note that this option does not include a new crossing of the east intersection leg; this is modeled in Option 4 and could be combined with northbound right-turn channel removal in future if desired.

Beyond the core options identified above that are the focus of this study, a series of supporting options are identified below that the City may choose to consider as part of improvements focused on this intersection and/or as broader network improvements are pursued.

- Accessible design improvements to support safe crossing for people with physical, visual, audible and cognitive disabilities, including tactile features on curb ramps and audible signals.
- Pedestrian countdown timers provide information for pedestrians by providing information on the amount of time remaining to complete the crossing within the allotted green time, providing comfort to people crossing and allowing faster crossing pedestrians to cross later in the crossing cycle.
- Speed reduction measures to reduce vehicle speeds on the approach and through the intersection to facilitate safer, more comfortable conditions for people crossing, which may include reduced speed limits, upstream gateway treatments, reduced travel lane widths or reduced intersection corner radii.
- Placemaking applications that signify this intersection as an extension of the Downtown area and alert motorists to the heightened pedestrian activity in the vicinity, including increased landscape and street trees, intersection/crossing surface treatments and additional lighting (functional, decorative).

- A pedestrian actuated ('half') signal at the 5th Street / Anderton Avenue intersection could help address the lack of crossing on the intersection east leg, while also facilitating north-south cyclist travel (particularly as the 6th Street Active Transportation Bridge is advanced).
- Full or partial closure of 5th Street west of the Cliffe Avenue / 5th Street intersection is being contemplated through the Downtown Vitalization Local Area Plan (DVLAP) process. Any such closure would enhance crossing opportunities by reducing the number of crossing legs and decreasing traffic volumes through this location, with attention needed to understand the impact of redistributing traffic onto other corridors.

4.0 TRAFFIC ANALYSIS

4.1 MODELING PARAMETERS

Traffic analysis was completed using Synchro 12 and SimTraffic 12 software which is a well recognized traffic operational analysis tool by the industry.

The performance measures assessed in this analysis include the 95th percentile queue length, the average vehicle delay and the corresponding level of service (LOS). 95th percentile queue length refers to a queue length which is exceeded only 5% of the time. The LOS measure is directly related to the average delay experienced by drivers for turning movements and for the overall intersection. The six levels of service and the corresponding delay thresholds are illustrated below in **Table 1**. Generally, LOS A to C indicates significant capacity available, LOS D indicates demand is approaching capacity, LOS E indicates an intersection or lane group is near or at capacity, and LOS F indicates demand has exceeded capacity.

TABLE 1. TRAFFIC LEVEL OF SERVICE THRESHOLDS FOR SIGNALIZED INTERSECTIONS

Level of Service (LOS)	Control Delay (s)
A	0-10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

4.2 MODELING ASSUMPTIONS

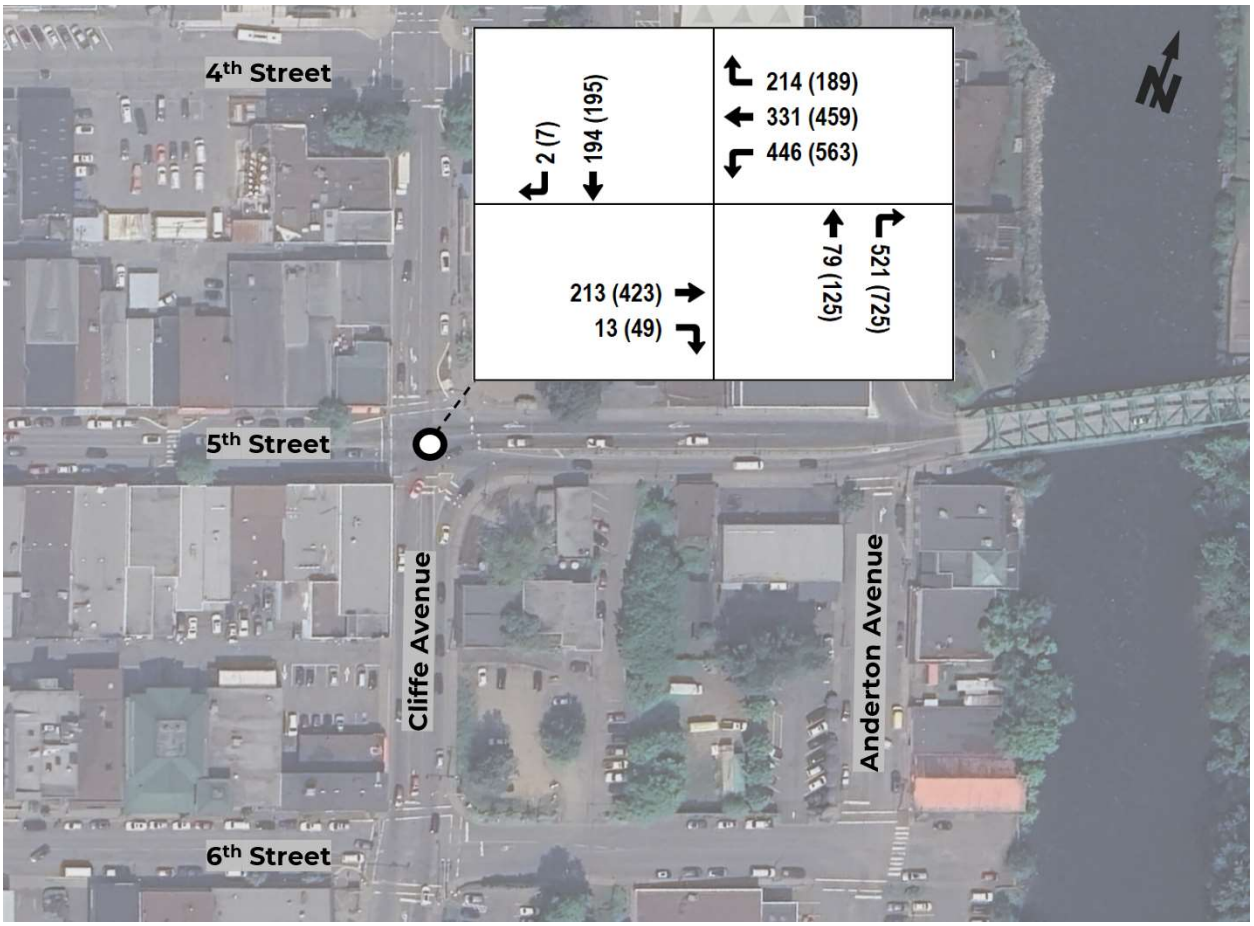
Assumptions used to model each scenario are described below:

Base Case – typical weekday morning (8-9am) and afternoon (4-5pm) peak periods were modeled for all options. At this time, collection of updated traffic counts accurately reflecting typical conditions was not possible due to Valley-wide road closures and traffic management associated with the Comox Valley Sewer Conveyance project. As a result, traffic volumes for this study were derived from 2016 data, scaled to account for background traffic growth at a 2% linear rate. The approximate 2025 traffic volumes were also adjusted using anonymized TomTom travel speed data from September to December 2024 to ensure existing conditions results from SimTraffic reasonably reflected peak hour queue lengths.

As of the time of writing, southbound left turns are not permitted from Cliffe Avenue from 8am-5pm Monday to Saturday, except for buses. In the future, this southbound left bus movement during peak hours will no longer be necessary, once the downtown transit exchange is moved to its new location on 8th Street. No southbound left turning vehicles have been accounted for in the Synchro modeling under any of the scenarios as a result. Westbound and northbound left turns are also not permitted at this intersection.

Traffic volumes used for modeling are shown in **Figure 2** below. The Cliffe Avenue / 5th Street intersection sees the highest motor vehicle volumes during the afternoon peak hour, especially utilizing the east leg (5th Street Bridge). As a result, the northbound right and westbound left movements are heaviest, followed by east-west traffic along 5th Street.

FIGURE 2. AM (PM) PEAK HOUR INTERSECTION TRAFFIC VOLUMES FOR MODELING



Existing in-field signal timings were utilized for the base case modelling to reflect current conditions. To be conservative, pedestrian crossing phases were assumed to be triggered every cycle during the morning and afternoon peak hours.

For each of the proposed options to follow, Synchro-optimized signal timings were tested but mostly performed more poorly than existing signal timings when simulated in SimTraffic. As a result, existing signal timings were utilized for reporting, to ensure relative comparison between each option most representative of anticipated future performance. The only exception is Option 1 (Scramble) where optimized signal timings were used due to significant timing changes, limited to a 120-second cycle length.

Option 1 (Scramble) – A 27m crossing distance was assumed with a 1 m/s typical walking speed. This represents a pedestrian crossing between the northwest and southeast corners of the intersection (including the NB channelized right turn). This results in an overall pedestrian scramble phase time of 30 seconds, including 3 seconds for all red time following the end of the countdown timer. To be

conservative, the pedestrian scramble phase was also assumed to be triggered every cycle during the morning and afternoon peak hours.

Option 2 (LPI) – An LPI time of 5 seconds was modelled for the eastbound and westbound directions; this is appropriate for the pedestrian crossing distances at this intersection (generally 12-15m). In this case, LPI is aimed at reducing conflicts between right-turning vehicles and pedestrians, as left turn vehicle movements are either protected-only or restricted. No LPI was modeled for the northbound or southbound movements, due to the presence of a right-turn signal on the northbound approach and very low right-turning vehicle volumes on the southbound approach.

Option 3 (No RTOR) – The right-turn-on-red option was restricted for all approaches.

Option 4 (East Leg Crossing) – A 7 second pedestrian "Walk" phase, followed by a 15 second "Flash Don't Walk" time was used, based on pedestrian crossing distance inclusive of the northbound channelized right-turn. Pedestrians cross from the southeast corner of the intersection (Cliffe & 5th Park) to the pedestrian refuge island during the east-west signal phase, and then onto the northeast corner (Sid Williams Theatre) during the north-south phase. This retains the same functionality of the dedicated northbound right turn phase.

Option 5 (NB Right-Turn Channel Removal) – The northbound channelized right-turn lane was replaced in Synchro with a dedicated right-turn lane and conventional curb return. No changes were made to signal phasing compared to the base case. Vehicle turning speed for northbound right-turning vehicles was reduced to 14 km/h (typical value), whereas 25 km/h was used for all other options retaining the channelized turn geometry.

4.3 MODELING RESULTS

Results for comparison between options were modeled in SimTraffic 12, which offers greater sensitivity to geometry and pedestrian signal timing changes than Synchro. For each scenario and time period, five SimTraffic simulations were run, with the average reported in the results.

Table 2 and Table 3 below outline the delay and queue lengths for the base case, and additional impact for each option expressed as absolute and percent difference. See **Appendix A** for detailed results.

Critical movements at this intersection are typically westbound (across the 5th Street Bridge). The impact on these movements from each of the options is presented in the tables below. Northbound movements also see high queues (particularly afternoon northbound right-turns), and these results have been included in the base case critical movement summary for comparison with Option 5 (Northbound Right-Turn Channel Removal), which primarily impacts this movement.

TABLE 2. 2025 INTERSECTION MOTOR VEHICLE PERFORMANCE OVERVIEW, AM PEAK PERIOD

Model Scenario	Overall Intersection		Critical Movement(s)			
	Delay (s)	LOS	Mvmt	Delay (s)	LOS	95% Queue Length (m)
AM Peak Period						
Base Case	**16.3**	**B**	NBT	25.2	C	28
			NBR	3.5	A	43
			WBL	29.5	C	91
			WBT	11.2	B	79
			WBR	8.6	A	79
Option 1 (Scramble)	**48.0**	**D**	WBL	+56.9 (+193%)	F	+22 (+24%)
			WBT	+41.4 (+370%)	D	+277 (+353%)
			WBR	+35.5 (+413%)	D	+277 (+353%)
Option 2 (LPI)	**16.5**	**B**	WBL	+0.5 (+2%)	C	+2 (+2%)
			WBT	+0.3 (+3%)	B	+20 (+26%)
			WBR	+0.6 (+7%)	A	+20 (+26%)
Option 3 (NRTOR)	**17.6**	**B**	WBL	-0.7 (-2%)	C	0 (0%)
			WBT	+1.5 (+13%)	B	0 (0%)
			WBR	+2.7 (+31%)	B	0 (0%)
Option 4 (East Leg X-ing)	**17.2**	**B**	WBL	+2.1 (+7%)	C	+4 (+4%)
			WBT	+1.8 (+16%)	B	-2 (-3%)
			WBR	+1.9 (+22%)	B	-2 (-3%)
Option 5 (NB Right-Turn Channel Removal)	**18.1**	**B**	NBT	+1.3 (+5%)	C	+15 (+54%)
			NBR	+7 (+200%)	B	+20 (+46%)

TABLE 3. 2025 INTERSECTION MOTOR VEHICLE PERFORMANCE OVERVIEW, PM PEAK PERIOD

Model Scenario	Overall Intersection		Critical Movement(s)			
	Delay (s)	LOS	Mvmt	Delay (s)	LOS	95% Queue Length (m)
PM Peak Period						
Base Case	**27.3**	**C**	NBT	29.4	C	72
			NBR	7.2	A	71
			WBL	49.9	D	110
			WBT	20.9	C	258
			WBR	19.0	B	258
Option 1 (Scramble)	**86.6**	**F**	WBL	+92.4 (+185%)	F	-11 (-10%)
			WBT	+78.3 (+375%)	F	+227 (+88%)
			WBR	+79.3 (+417%)	F	+227 (+88%)
Option 2 (LPI)	**32.0**	**C**	WBL	+9.9 (+20%)	E	+2 (+2%)
			WBT	+8.5 (+41%)	C	+94 (+37%)
			WBR	+7.4 (+39%)	C	+94 (+37%)
Option 3 (NRTOR)	**29.8**	**C**	WBL	+3.9 (+8%)	D	+1 (+1%)
			WBT	+3.4 (+16%)	C	+45 (+17%)
			WBR	+5.5 (+29%)	C	+45 (+17%)
Option 4 (East Leg X-ing)	**42.6**	**D**	WBL	+33.5 (+67%)	F	+3 (+2%)
			WBT	+26.2 (+125%)	D	+193 (+75%)
			WBR	+22.8 (+120%)	D	+193 (+75%)
Option 5 (NB Right-Turn Channel Removal)	**30.7**	**C**	NBT	+3.6 (+12%)	C	+31 (+43%)
			NBR	+9.6 (+133%)	B	+4 (+5%)

Existing conditions see significant queues in the westbound direction along 5th Street, particularly in the afternoon peak period. The approximately 260m 95th percentile queue length outlined above corresponds to in-field observations of queues extending beyond the Lewis Park access east of the 5th Street Bridge. This also does not account for interactions with the signalized intersection at Comox Road, which typically exacerbates delays and queuing along 5th Street.

The pedestrian scramble (Option 1) performs more poorly across all movements, with approximately 3x longer overall intersection delays during peak periods compared to the base case. Westbound queue lengths under this scenario are anticipated to worsen considerably, increasing 4x in the morning peak period and nearly doubling in the afternoon peak. However, this likely overestimates queue length as it does not account for rebalancing of motor vehicle trips across the network given reduced capacity.

The LPI (Option 2) and No RTOR (Option 3) scenarios perform slightly worse than the base case in both peak periods. Vehicle queue lengths are most affected in the westbound direction, with increases of

20m and less than 1m in the morning and 94m and 45m in the afternoon for Option 2 and 3, respectively. Vehicle delay also increases for the northbound right movement under the NRTOR scenario, primarily due to reduced vehicle capacity. Note that the impact of the LPI option would be further reduced with implementation of a reduced 3 second interval.

The addition of a pedestrian crossing on the east leg (Option 4) impacts traffic primarily in the afternoon peak period. This is primarily due to additional time allocated to the north-south phase, to ensure pedestrians have sufficient time to cross. Overall intersection delay in the PM peak increases by approximately 125% compared to the base case, with westbound queues increasing up to nearly 200m due to the extended cycle length.

The Northbound Right-Turn Channel Removal (Option 5) performs similarly to the base case, with overall intersection delay increasing by 2-3 seconds. Only the northbound movements are significantly impacted by this scenario, due to reduced right-turning vehicle speeds. Delay increases up to 10s for the northbound right-turn movement between AM and PM peak periods, with queue length increasing a maximum of approximately 30m. This is anticipated to cause queuing to back up into the Cliffe Avenue / 6th Street intersection, although these downstream impacts are not modeled in this study.

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5.0 SIGNAL INFRASTRUCTURE REVIEW

A signal infrastructure review was completed by PBX Engineering provide an overview of the existing traffic signal infrastructure at the Cliffe Avenue / 5th Street intersection. A site visit was completed by PBX on April 23rd 2025 to confirm the existing conditions.

5.1 SIGNAL POLES

The signal infrastructure at the intersection of Cliffe Avenue and 5th Street consists of 4 signal poles, the type of pole at each quadrant is listed in the table below. Pole capacity calculations were also completed in accordance with the Ministry of Transportation and Transit (MOTT) Pole Capacity Program to determine if it is feasible to install new infrastructure on the existing signal poles. The MoTT pole capacity program is only intended to be used for preliminary design and is not intended to be relied upon for final assessments. As the program is intended for preliminary design only, further review from a structural engineer is recommended if the City determines a full assessment is necessary.

TABLE 4. SUMMARY OF SIGNAL POLES AT CLIFFE AVENUE / 5TH STREET INTERSECTION

Pole #	Quadrant	Pole Type	Pole Loading (% of capacity)	Notes
1	NW	Type 1	Overloaded (158%)	Concrete base is buried and not visible. The pole sits on a riser that extends a few inches above grade.
2	NE	Type 7	Under Capacity (81%)	
3	SE	Type 6	Under Capacity (62%)	Concrete base is buried and sits slightly below sidewalk grade.
4	SW	Type 3	Overloaded (131%)	Concrete base sits flush with sidewalk, and does not appear to be a standard base size, indicating this may be a poured in place base.

As noted in **Table 4** above, Poles 1 and 4 were calculated to be overloaded under existing conditions. No new infrastructure (signs or signals) should be installed on the signal arms without further review from a structural engineer. New signal poles may be considered depending on the desired pedestrian crossing option.

To implement either the east leg crossing or pedestrian scramble options, additional pedestrian signal heads will be required. A pedestrian scramble typically involves the installation of diagonally facing pedestrian heads, angled towards the center of the intersection in addition to pedestrian heads (facing the adjacent quadrant) already installed. To accommodate new pedestrian signal heads, existing signal and pedestrian heads may need to be relocated or modified.

TABLE 5. POLE MODIFICATIONS FOR PEDESTRIAN CROSSING OPTIONS

Pole #	Reference Photo	Notes
1		**Pedestrian Scramble:** The lower secondary signal head could be raised to sit in line with the upper signal head to provide sufficient space for a diagonal facing pedestrian head.
2		**Pedestrian Scramble:** The existing secondary signal heads may be blocking the line of a sight of a new diagonal facing pedestrian head. Signal heads should be raised or adjusted to accommodate a new diagonal pedestrian head. A new pedestrian head can be installed on the right side of the pole and angled to face the adjacent quadrant. **East Leg Crossing:** Existing signal heads likely do not need to be relocated. A new pedestrian signal head can be mounted to the back side of the pole and aligned with the pedestrian crossing. A new push button will also need to be installed.
3		**Pedestrian Scramble:** The existing secondary signal head and left turn signal sign will need to be relocated to accommodate a diagonal facing pedestrian head.
4		**Pedestrian Scramble:** Existing pedestrian head should be relocated to a side mount bracket on the right side of the pole to accommodate a diagonal pedestrian head. A new pedestrian head can be installed on the rear of the pole (facing left). **East Leg Crossing:** Existing signal heads likely do not need to be relocated. A new pedestrian head can be installed on the rear of the pole and aligned with the new crossing. A new push button will also need to be installed.

In accordance with the BC Motor Vehicle Act, secondary and auxiliary signals are permitted to be installed not less than 1.25m and not more than 4.75m above the roadway.

5.2 UNDERGROUND INFRASTRUCTURE

The existing underground infrastructure at the intersection is summarized below based on record drawings and the site visit:

- Concrete Junction Boxes are located at each quadrant next to the signal poles.
- Junction boxes are connected with 1 x 53mm RPVC conduit. Conduits cross 3 legs of the intersection, the east leg (across 5th Street) does not have a complete conduit crossing.
    - The east leg of the intersection has 3 x 53mm RPVC conduits extending from a junction box at the SE quadrant. Record drawings show these conduits are stubbed in the road near the NE quadrant. Conduits could be located and extended to the NE quadrant junction box to avoid completing a full new road crossing.
- 1 x 35mm RPVC conduit connects signal poles and junction boxes.
- It was noted by both the City of Courtenay and Raylec during the site visit that there are no major concerns about being able to fill the existing conduits to their maximum capacity (i.e., there is no indication that conduits have caved in or been clogged with debris that would prevent pulling new conductors through the length of the conduit).
- Existing conduits crossing the roadway are estimated to be near capacity and therefore have limited capacity for new conductors. Refer to the section below for more details. The City of Courtenay personnel noted on site that there may be redundant or unused signal conductors installed in road crossings. Further investigation is recommended to confirm which conductors are redundant or unused and could therefore be removed to provide additional capacity.
- The northbound right turn movement is currently hardwired with the westbound left turn movement. If changes are made, these phases should be rewired with dedicated signal conductors in accordance with typical standard practice. Programming changes can be made in the controller using an overlap phase to ensure the signal remains operationally the same as if these phases were hardwired together.

Conduit Capacity

Conduit fill calculations were completed to estimate the capacity available to install new signal conductors in existing conduits for a typical road crossing, as well as a typical connection between junction box and signal pole.

TABLE 6. CONDUIT INFRASTRUCTURE AND ESTIMATED CONDUIT FILL

Connection	Size of Conduit	Conductors	Estimated Conduit Fill [1]
JB to Signal Pole	35mm	22 x #14 AWG (Signal Cables)	20% [2]
JB to JB (Road Crossing)	53mm	45 Total (Signal Cables) 39 x #14 AWG 3 x #12 AWG 3 x #10 AWG 7 x Belden Cables (Detector Loops)	35% [2]

[1] Estimated conduit fill is based on a count made on site for a typical section of conduit. Counts were not made for every conduit at the intersection. Exact numbers may differ.

[2] The CEC requires conduits to not be filled more than 40%.

The conduit crossing along the north leg of the intersection contains the most conductors and is the most likely conduit to be problematic should new signal or loop detectors be required. A few strategies may be implemented to ensure new signal conductors can be added to the system:

- Remove redundant conductors: The City of Courtenay personnel on site noted that several conductors in this conduit are redundant and could be removed.
- Locate and extend conduits at the east leg of the intersection to complete the crossing. Signal and loop detector conductors could be re-routed across this leg to reduce the total conductors in the north crossing.

5.3 TRAFFIC CONTROLLER

The existing traffic controller is a Cobalt controller, installed in a Type P44 traffic control cabinet and was installed in 2021. This controller is modern and changes in the controller programming can be made to accommodate any of the pedestrian crossing options discussed in **Section 3.2** above.

5.4 PEDESTRIAN CROSSING OPTIONS

Table 7 below addresses how the existing electrical infrastructure impacts each of the 5 pedestrian crossing enhancement opportunities being considered at the intersection.

TABLE 7. SUMMARY OF INFRASTRUCTURE IMPACTS TO PROPOSED PEDESTRIAN ENHANCEMENTS

Option	Proposed Upgrade	Comments
1	Pedestrian Scramble	Typical pedestrian scrambles include a 'diagonal' pedestrian head, aimed towards the center of the intersection in addition to pedestrian heads aimed at the adjacent quadrant. New pedestrian heads, along with signal conductors would be required to implement this option. Refer to **Table 5** above for expected signal impacts. It was noted on site that a pedestrian scramble was recently implemented in Duncan and no additional pedestrian heads were added. In this case, the pedestrian scramble could be accommodated with only changes to the controller programming.
2	Leading Pedestrian Interval (LPI)	Implementing an LPI can be accomplished through programming of the traffic controller. It was noted while on site that the City of Courtenay recently implemented 2 similar LPI's at different intersections using the same traffic controller with no issues.
3	No Right Turn on Red	'No Right Turn On Red' is typically indicated through signage. If signs are added, they should be installed on the signal pole shaft only for Poles 1 and 4 to prevent further overloading.
4	East Leg Crossing	An east leg crossing would require additional pedestrian signals and pushbuttons. In this scenario, it would be recommended to extend the existing conduit that is capped in the roadway to avoid a complete new road crossing.
5	Northbound Right-Turn Channel Removal	Vehicle detection loops may need to be modified. If new detector loops are required, it is recommended to extend the existing conduit that is capped in the roadway to avoid a complete new road crossing.

6.0 OPTIONS ASSESSMENT

The intersection crossing improvement options identified in ***Section 3.2*** have been assessed below to provide comparison and include evaluation on other factors beyond motor vehicle traffic performance.

Evaluation ratings are provided based on the level of service provided for each option as compared to the base case (existing condition), across a range of criteria. Descriptions of each evaluation level are provided below:

6.1 ASSESSMENT CRITERIA

The following criteria are identified to cross-compare the corridor options against the base case.

Walking Comfort + Safety	Safety and comfort for people walking considering separation from and potential conflicts with vehicles, physical waiting space.
Walking Crossing Time	Changes to pedestrian crossing time resulting from intersection improvements.
Motor Vehicle Performance	Intersection performance for general purpose traffic and transit including overall or movement-specific delay and queue lengths. With absence of dedicated transit priority measures, service impacts of buses in traffic queues should be considered.
Placemaking / Vitalization	Ability to support placemaking and downtown vitalization initiatives along 5th Street and Cliffe Avenue corridors.
Construction Impact	Anticipated impact of construction on traffic circulation and neighbouring businesses, including construction length and magnitude of interruption.
Capital Cost	Anticipated capital cost in consideration of new and/or repurposed infrastructure, and cost of enhancements.

6.2 ASSESSMENT SUMMARY

A summary of the level of service provided for each option as compared to current levels is provided in **Table 8** below. This aligns with the assessment criteria outlined above. A brief description of the assessment for each option is also provided below.

TABLE 8. EVALUATION SUMMARY COMPARED TO BASE CASE

	Base Case	Option 1 (Scramble)	Option 2 (LPI)	Option 3 (NRTOR)	Option 4 (E Leg X)	Option 5 (NB Right)
Walking Comfort + Safety	~	+	+	+	+	+
Reduced Walking Crossing Time	~	+	~	~	+	+
Motor Vehicle Traffic Performance	~	-	-	-	-	-
Placemaking / Vitalization	~	+	~	~	+	+
Construction Impact	~	~	~	~	-	-
Capital Cost	~	~	~	~	-	-

Option 1 (Scramble)

- Pedestrian comfort, safety and intersection crossing time see the largest possible improvement
- Motor vehicle performance is severely impacted with 2-3x delay and very long queues
- Vitalization benefit through increased walkability and connectivity through intersection
- No construction impact or capital cost beyond line paint and signal timing updates
    - New pedestrian signal head recommended but not required for implementation

Option 2 (LPI) + Option 3 (NRTOR)

- Pedestrian comfort and safety are improved due to reduced motor vehicle conflicts
- Intersection crossing time remains constant for people walking
- Mild-moderate impact to motor vehicle performance due to reduced green time being allocated to motor vehicles and / less capacity for right turning vehicles.
- No construction impact or capital cost signal timing updates and signage

Option 4 (East Leg Crossing)

- Pedestrian comfort and safety improved with upgrades / expansion to pedestrian refuge island
- Pedestrian crossing time reduced with additional crossing leg
- Moderate impact to the westbound motor vehicle performance due to increased north-south phase length
- Expanded pedestrian refuge island supports vitalization and increases walking connectivity
- Mild construction impact from minor civil works to reconfigure pedestrian refuge island
- Moderate capital cost associated with civil works and signal infrastructure upgrades

Option 5 (NB Right-Turn Channel Removal)

- Pedestrian comfort and safety significantly improved by removing channelized turn and island
- Slight pedestrian crossing time improvement by removing two-stage crossing along south leg
- Mild impact to motor vehicle performance due to reduced turning speed and capacity
- Significant placemaking and vitalization benefits due to additional public space
- Mild construction impact from minor civil works to remove channelized turn
- Moderate capital cost associated with civil works and signal infrastructure changes

7.0 SUMMARY

Each of the five options assessed in this Cliffe Avenue / 5th Street intersection review present improvements to pedestrian comfort and safety and/or crossing time, to varying degrees and with other benefits / disbenefits as outlined above.

Implementing a pedestrian scramble (Option 1) offers by far the highest degree of improvement to pedestrian comfort, safety and connectivity. It encompasses elements of the other four options considered, and as such would be pursued exclusively. **However, the negative impacts on motor vehicle traffic impacts are significant.** As a major intersection connecting people from east and west Courtenay, and the main alternative to the 17th Street Bridge, increased delays from a pedestrian scramble configuration would have wide-ranging implications and likely require other investment in the road network to continue to support acceptable traffic conditions. It is also important to note that transit service would be impacted to the same degree as general purpose traffic, which includes impacts on Route 1, the frequent transit service for the Valley, and on emergency service response.

The east leg crossing (Option 4) and northbound right-turn channel removal (Option 5) are opportunities to better balance pedestrian safety and crossing opportunity with vehicle operations, which have conventionally been prioritized, with modest impact on traffic performance. These opportunities could be pursued in tandem, where the northbound right-turn channel is removed and an east leg crossing is added. The east leg crossing option requires additional pedestrian signals and pushbuttons; the northbound right-turn channel removal may require new vehicle detection loops. If the east leg crossing is pursued, the City should consider adding “No Right-Turn-on-Red” and “Right Turn Signal” signage for the northbound right movement along Cliffe Avenue, to ensure motor vehicles are obeying the right-turn signal in place, prioritizing pedestrian safety.

Implementing leading pedestrian intervals (Option 2) or restricting right-turns on red (Option 3) are modifications to signal operations or signage only. Traffic impacts are modest with both options. These options could be pursued in tandem with either civil infrastructure improvements (i.e., either Option 4, 5, or both).

Consideration for all options may also be given to the series of supporting opportunities identified in Section 2 that may be implemented without impacting traffic performance, including accessible design treatments, placemaking and speed reduction measures.

Any future signal infrastructure upgrades should also be planned and completed in coordination with upgrades at the 6th Street and 8th Street intersections with Cliffe Avenue, to ensure opportunities for signal coordination and more effective traffic operations are realized.

8.0 CLOSING

We trust the preceding analysis provides the necessary understanding of opportunities to enhance pedestrian crossing opportunities at the Cliffe Avenue / 5th Street intersection.

Please do not hesitate to contact the undersigned with any questions.

Sincerely,

URBAN SYSTEMS LTD.

Dan Casey, RPP MCIP
Transportation Planner

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Transportation Engineer

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APPENDIX A.
INTERSECTION TRAFFIC ANALYSIS

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2025 Existing Conditions Scenario

Approach	Delay (s)	Level of Service	95% Queue Length (m)
Base Model (Existing Field Signal Timings)			
Eastbound Thru	22.6 (38.3)	C (D)	45.1 (111.7+)
Eastbound Right	14.4 (29.3)	B (C)	16.7* (23.1*)
Westbound Left	29.5 (49.9)	C (D)	90.7* (109.7*)
Westbound Thru	11.2 (20.9)	B (C)	78.5 (257.8)
Westbound Right	8.6 (19.0)	A (B)	78.5 (257.8)
Northbound Thru	25.2 (29.4)	C (C)	28.1 (72.3)
Northbound Right	3.5 (7.2)	A (A)	43.1 (70.9*)
Southbound Thru	25.4 (32.4)	C (C)	47.5 (56.3)
Southbound Right	32.0 (28.1)	C (C)	47.5 (56.3)
Intersection	**16.3 (27.3)**	**B (C)**	**- (-)**
Option 1 - Pedestrian Scramble - Optimized Timings			
Eastbound Thru	51.9 (112.1)	D (F)	73.8 (132.0+)
Eastbound Right	26.4 (93.0)	C (F)	15.3* (21.6*)
Westbound Left	86.4 (142.3)	F (F)	112.2* (98.7*)
Westbound Thru	52.6 (99.2)	D (F)	355.4 (485.0+)
Westbound Right	44.1 (98.3)	D (F)	355.4 (485.0+)
Northbound Thru	35.5 (58.6)	D (E)	30.0 (96.7+)
Northbound Right	4.4 (12.6)	A (B)	42.8 (75.5*)
Southbound Thru	75.1 (139.7)	E (F)	81.8+ (100.5+)
Southbound Right	54.9 (118.3)	D (F)	81.8+ (100.5+)
Intersection	**48.0 (86.6)**	**D (F)**	**- (-)**
Option 2 - LPI			
Eastbound Thru	22.7 (43.0)	C (D)	46.7 (118.9+)
Eastbound Right	12.4 (31.7)	B (C)	14.1 (23.5*)
Westbound Left	30.0 (59.8)	C (E)	92.6* (112.1*)
Westbound Thru	11.5 (29.4)	B (C)	98.9 (351.9)
Westbound Right	9.2 (26.4)	A (C)	98.9 (351.9)
Northbound Thru	24.5 (30.2)	C (C)	22.1 (90.0+)
Northbound Right	3.3 (8.0)	A (A)	39.2 (74.4*)
Southbound Thru	26.2 (29.6)	C (C)	48.5 (55.0)
Southbound Right	20.5 (17.9)	C (B)	48.5 (55.0)
Intersection	**16.5 (32.0)**	**B (C)**	**- (-)**
Option 3 - No Right Turn on Red			
Eastbound Thru	22.4 (42.1)	C (D)	46.9 (118.3+)
Eastbound Right	26.7 (41.5)	C (D)	15.1* (23.9*)
Westbound Left	28.8 (53.8)	C (D)	91.1* (111.1*)
Westbound Thru	12.7 (24.3)	B (C)	78.1 (302.7)
Westbound Right	11.3 (24.5)	B (C)	78.1 (302.7)
Northbound Thru	25.0 (29.0)	C (C)	41.7 (83.0+)
Northbound Right	5.7 (8.6)	A (A)	59.8* (72.9*)
Southbound Thru	29.0 (29.9)	C (C)	53.6 (51.2)
Southbound Right	35.5 (29.8)	D (C)	53.6 (51.2)

Approach	Delay (s)	Level of Service	95% Queue Length (m)
Intersection	**17.6 (29.8)**	**B (C)**	**- (-)**
Option 4 - East Leg Crossing			
Eastbound Thru	26.0 (53.5)	C (D)	52.5 (128.2+)
Eastbound Right	13.9 (43.5)	B (D)	11.8 (23.5*)
Westbound Left	31.6 (83.4)	C (F)	94.5* (112.4*)
Westbound Thru	13.0 (47.1)	B (D)	76.1 (450.3+)
Westbound Right	10.5 (41.8)	B (D)	76.1 (450.3+)
Northbound Thru	21.5 (27.8)	C (C)	35.4 (73.5)
Northbound Right	3.8 (7.2)	A (A)	48.8 (71.1*)
Southbound Thru	24.2 (30.0)	C (C)	44.5 (51.9)
Southbound Right	16.7 (20.9)	B (C)	44.5 (51.9)
Intersection	**17.2 (42.6)**	**B (D)**	**- (-)**
Northbound Right-Turn Channel Removal			
Eastbound Thru	22.6 (42.1)	C (D)	45.8 (117.3+)
Eastbound Right	11.1 (31.9)	B (C)	14.4 (24.9*)
Westbound Left	29.2 (50.7)	C (D)	90.4* (110.0*)
Westbound Thru	10.7 (22.3)	B (C)	69.5 (266.7)
Westbound Right	7.9 (19.6)	A (B)	69.5 (266.7)
Northbound Thru	26.5 (33.0)	C (C)	43.4 (103.7+)
Northbound Right	10.5 (16.8)	B (B)	62.8* (74.7*)
Southbound Thru	27.7 (29.3)	C (C)	48.4 (54.8)
Southbound Right	9.1 (17.8)	A (B)	48.4 (54.8)
Intersection	**18.1 (30.7)**	**B (C)**	**- (-)**

** : 95th percentile queue length exceeds storage length*

+ : 95th percentile queue length exceeds lane link distance

Note: all scenarios utilize existing in-field signal timings, except for Option 1 (Scramble) which uses Synchro-optimized signal timings due to large changes to signal operations.