



City of Richmond

Report to Committee

To: Public Works and Transportation Committee **Date:** January 17, 2022
From: Lloyd Bie, P.Eng.
 Director, Transportation **File:** 10-6450-07-01/2022-
 Vol 01
Re: **Traffic Operations at No. 2 Road-Steveston Highway and No. 1 Road-Francis Road - Report Back on Referral**

Staff Recommendation

That the staff report titled "Traffic Operations at No. 2 Road-Steveston Highway and No. 1 Road-Francis Road - Report Back on Referral" dated January 17, 2022, from the Director, Transportation, be received for information.

Lloyd Bie, P.Eng.
 Director, Transportation
 (604-276-4131)

Att. 1

REPORT CONCURRENCE		
ROUTED TO: RCMP	CONCURRENCE <input checked="" type="checkbox"/>	CONCURRENCE OF GENERAL MANAGER
SENIOR STAFF REPORT REVIEW	INITIALS: 	APPROVED BY CAO

Staff Report

Origin

At the December 14, 2021 meeting of the Public Works and Transportation Committee, a delegate attended to speak on traffic light operations at intersections, particularly No. 2 Road-Steveston Highway and No. 1 Road-Francis Road. Following discussion, the following referral motion was carried:

- (1) *That the presentation by Jeff Jones, Richmond resident on traffic light operations, including traffic signal timing, at intersections be referred to staff; and*
- (2) *That staff report back with crash data analysis at No.2 Road and Steveston Highway.*

This report responds to the referral.

This report supports Council's Strategic Plan 2018-2022 Strategy #1 A Safe and Resilient City:

Enhance and protect the safety and well-being of Richmond.

1.1 Enhance safety services and strategies to meet community needs.

This report supports Council's Strategic Plan 2018-2022 Strategy #6 Strategic and Well-Planned Growth:

Leadership in effective and sustainable growth that supports Richmond's physical and social needs.

6.3 Build on transportation and active mobility networks.

Analysis

Traffic Signal Timing for Advance Left Turns

Generally, the type of left turn signal operation at a signalized intersection considers vehicle volumes, vehicle approach speeds, intersection geometry (e.g., number of through and turn lanes), intersection widths, and the presence or absence of a left turn lane. Vehicle and bicycle detectors or sensors are installed within the roadway to detect the presence of vehicles and measure if queues are adequate to request a left turn signal. Detectors primarily consist of wire loops cut into the pavement approaching the stop line. They are activated by the change of electrical inductance caused by a metal mass (vehicle or bicycle) passing or resting over the wire loop. The City also uses video detection cameras that use imaging recognition technology to detect vehicles.

No. 2 Road-Steveston Highway Intersection

The No. 2 Road-Steveston Highway intersection has left turn lanes on Steveston Highway and has a protected/permmissive left turn signal installed in the westbound, eastbound and southbound directions. A left turn arrow for the northbound direction is not warranted. With this type of operation, left turn lanes share the same red/amber/green signal indications with the parallel through movement. A “flashing” (*protected*) left turn arrow is activated when a queue of approximately four vehicles are detected in the left lane. During the display of the solid green ball, left turns can be made (*permmissive*) when there are adequate gaps in opposing traffic to complete left turns safely.

This type of left turn phasing is designed to help minimize delay to all intersection users by allowing motorists to turn on the green ball after opposing traffic has cleared. The left turn arrows are turned off by computer control when traffic volumes are low, and sometimes during peak traffic conditions where low volume left turn arrows can interrupt the opposing direction’s signal synchronization.

The westbound, eastbound and southbound left turn arrows are programmed to be active between 7:00 am and 11:30 pm weekdays when there is a queue of three to five vehicles detected in the left turn lane. On average, there are 236 daily activations of the southbound left turn arrow, 65 daily activations of the westbound left turn arrow and 32 daily activations of the eastbound left turn arrow with most occurring during the morning and afternoon peak periods.

ICBC Crash Data

During the five-year period of 2016 to 2020 (the most recent ICBC data available), a total of 106 crashes were recorded at the intersection (Figure 1). Of this total, 69% (73) were property damage only and 31% (33) were casualty crashes resulting in injury. There were no fatalities.

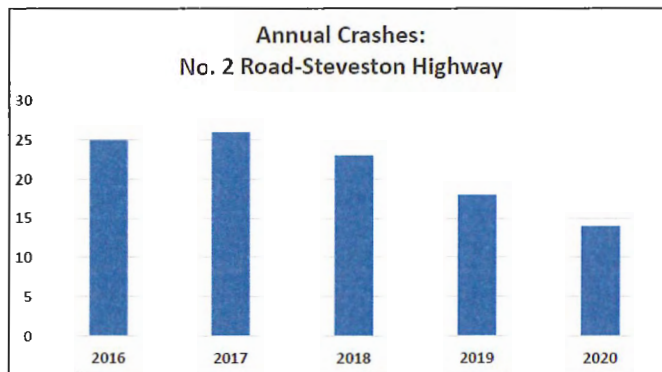


Figure 1: Annual Crashes at No. 2 Road-Steveston Hwy

The City’s network screening study, undertaken in 2019 using 2013 to 2017 ICBC crash data, identified and prioritized high collision locations in order to determine where road safety improvement investments should be directed to achieve the greatest safety benefits. The study ranked the No. 2 Road-Steveston Highway intersection at #55. Accordingly, improvements to this intersection will be undertaken once conditions at more highly ranked intersections are addressed.

No. 1 Road-Francis Road Intersection

The No. 1 Road-Francis Road intersection does not have any left turn lanes and has a protected/permmissive left turn signal installed in the northbound, southbound and westbound

directions. Since both through and left turn traffic share the same lane, opposing directions cannot receive a left turn arrow simultaneously. To accommodate this intersection configuration, the City developed a system called “swap-logic,” which works as follows:

- The system analyzes the presence of vehicle queues (approximately three to five vehicles) in the through/left turn lane in both opposing directions and selects one flashing left turn arrow per signal cycle
- If there are constant vehicle queues in both opposing direction, the system will alternate (or swap) the left turn arrow between each direction every cycle
- If there is a constant queue of vehicles in only one direction, the system will select a left turn arrow for that direction for each cycle the queue exists until a queue develops in the opposing direction, which will then get a left turn arrow the next signal cycle
- If there are no vehicle queues in either direction, no left turn arrows will be active

When there is a queue of three to five vehicles detected in the through/left turn lane, the northbound and southbound left turn arrows are programmed to be active between 7:00 am and 8:00 pm while the westbound left arrow is programmed to be active between 9:30 am and 8:00 pm. On average, there are 286 daily activations of the southbound left turn arrow, 93 daily activations for the westbound left turn arrow and 40 daily activations of the northbound left turn arrow with most occurring during the morning and afternoon peak periods.

ICBC Crash Data

During the five-year period of 2016 to 2020, a total of 162 crashes were recorded at the intersection (Figure 2). Of this total, 59% (96) were property damage only and 41% (66) were casualty crashes resulting in injury. There were no fatalities.

The City’s network screening study ranked the No. 1 Road-Francis Road intersection within the top 20 collision prone intersections at #17. The two-page Intersection Safety Review Report for the intersection (Attachment 1) identifies potential improvements (short-term and medium-/long-term). As part of the recommended short-term improvements, staff have completed the warrant analysis for adding a left turn phase for the eastbound approach and the left turn arrow is anticipated to be installed by the end of March 2022. Due to right-of-way constraints, long-term improvements to provide left turn lanes will be addressed as part of future adjacent development.

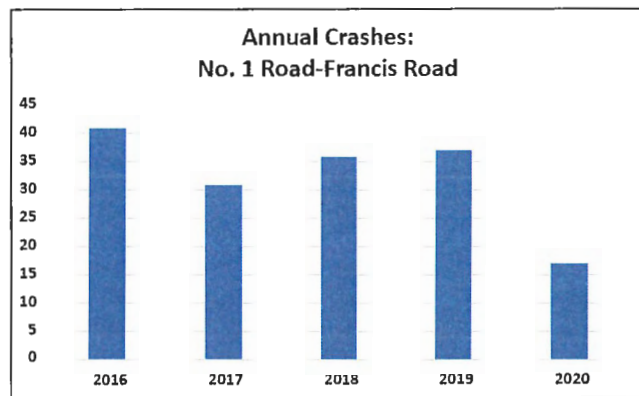


Figure 2: Annual Crashes at No. 1 Road-Francis Road

Financial Impact

None.

January 17, 2022

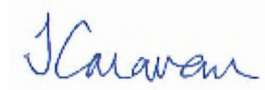
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Conclusion

Staff will continue to monitor traffic signal operations at the No. 2 Road-Steveston Highway and No. 1 Road-Francis Road intersections via traffic cameras to ensure adequate signal timing is in place for all intersection movements.



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Joan Caravan
Transportation Planner
(604-276-4035)



BJ:jc

Att. 1: No. 1 Road-Francis Road – Intersection Safety Review Report

No. 1 Road-Francis Road: Intersection Safety Review Report



Network Screening Study
City of Richmond

NO. 1 ROAD & FRANCIS ROAD																					
INTERSECTION INFORMATION	COLLISION STATISTICS (2015-2017)																				
<p>Site #: 17</p> <p>Intersection Type: 4-Legged</p> <p>Traffic Control Type: Signalized - P/P LT for N-S & WB</p> <p>N-S Street Classification: Arterial</p> <p>E-W Street Classification: Arterial</p> <p>Surrounding Land Use: Comm. / Rec. / Inst. / Resl.</p> <p>Daily Traffic Volume (2015): 27,200 Entering Vehicles</p> 	<p>Collision Frequency: 27.3 per year (Total = 82)</p> <p>Collision Severity Index: 4.73 (Casualty = 41%)</p> <p>Collision Rate OBS. / CRT.: 2.99 / 3.41 [2013-2017]</p> <p>Collision with Pedestrian: 0</p> <p>Collision with Cyclist: 2</p>  <table border="1"> <caption>Collision Data by Year and Severity</caption> <thead> <tr> <th>Year</th> <th>Total</th> <th>Property Damage Only</th> <th>Injury</th> <th>Fatal</th> </tr> </thead> <tbody> <tr> <td>2015</td> <td>28</td> <td>16</td> <td>10</td> <td>2</td> </tr> <tr> <td>2016</td> <td>31</td> <td>14</td> <td>17</td> <td>0</td> </tr> <tr> <td>2017</td> <td>25</td> <td>18</td> <td>7</td> <td>0</td> </tr> </tbody> </table> <p>Highest % Month: May / June (13%)</p> <p>Highest % Day of Week: Friday / Wednesday (20%)</p> <p>Highest % Time Period: 3 PM - 6 PM (29%)</p> <p>Top 3 Collision Types: Rear End (31%), Left Turn (30%), Sideswipe (26%)</p>	Year	Total	Property Damage Only	Injury	Fatal	2015	28	16	10	2	2016	31	14	17	0	2017	25	18	7	0
Year	Total	Property Damage Only	Injury	Fatal																	
2015	28	16	10	2																	
2016	31	14	17	0																	
2017	25	18	7	0																	
IDENTIFIED OPERATIONAL AND SAFETY ISSUES																					
<p>Geometric:</p> <ul style="list-style-type: none"> Lack of left-turn bay – all approaches; limited visibility of through traffic for left-turn drivers Lane drop after intersection due to on-street parking during off-peak periods – south, east, and west legs Commercial and recreational driveways close to intersection – north, east, and west legs 																					
<p>Signal:</p> <ul style="list-style-type: none"> Lack of left-turn phase – eastbound approach Provision of left-turn phase without left-turn bay – north-south and westbound approaches No countdown for pedestrian signal phases – all directions 																					
<p>Vulnerable Road User:</p> <ul style="list-style-type: none"> Substantial pedestrian crossing activities – all legs (to/from retail stores and nearby community centres and schools); conflict between left/right-turn vehicles and crossing pedestrians No bicycle facilities provided – overall intersection 																					
<p>Collision (Data Review):</p> <ul style="list-style-type: none"> High number of rear-end collisions occurred on No. 1 Road approaches – 10 for northbound and 7 for southbound; out of total 24 collisions High number of left-turn opposing collisions occurred on N-S direction – 85%; 22 out of total 23 collisions High proportion of sideswipe collisions reported for northbound (6), followed by eastbound/southbound (4); out of total 20 collisions Two cyclist-involved collisions occurred between vehicles turning left/right from No. 1 Road onto Francis Road and bicycle crossing east/west leg of the study intersection 20 extra collisions reported at the driveways of Seafair Centre (shopping plaza) located on the northwest corner of the intersection – 14 collisions at the driveway along No. 1 Road and 6 collisions at the driveway to Francis Road 																					
<p>Operational (Field Review):</p> <ul style="list-style-type: none"> Significant left-turn volumes/queues during commuter and school peak periods – north-south approaches; aggressive turning manoeuvres Significant lane changing/weaving activities – all directions; due to lack of left-turn bays Road work and lane closure on the northwest corner during the field review in early April 																					



No. 1 Road-Francis Road: Intersection Safety Review Report



Network Screening Study
City of Richmond

NO. 1 ROAD & FRANCIS ROAD

Other:

- None

POTENTIAL IMPROVEMENTS

Short-Term (Potential Safety Benefit – 10 to 20% of Total Collisions):

- Review and adjust signal timing to provide priority and/or dedicated pedestrian phase – *all approaches*
- Paint green pavement marking for crosswalk to alert drivers for substantial pedestrian crossing activities – *all legs*
- Review and relocate/remove on-street parking close to intersection – *south, east, and west legs*
- Conduct warrant analysis for adding left-turn phase – *eastbound approach*
- Educate community centre children and school students regarding safe pedestrian crossing – *overall*

Medium/Long-Term:

- Consolidate commercial driveways with future redevelopment – *north leg*
- Add left-turn phase (if warranted) – *eastbound approach*
- Add left-turn bays with future redevelopments in the future – *all approaches, particular north-south directions*
- Conduct a detailed in-service operation and safety study to include the safety review of nearby commercial driveways – *overall*

