

Six Mile Corridor Study

Process

Existing Condition Analysis

- Data collection, Synchro traffic model development.

Future Approved Development Condition Analysis

- Calculate anticipated additional vehicle trips from three known local area developments.
- Add background growth to external “gate” roads - Highway 1, Island Highway and Atkins Road.

Open House #1 May 1, 2019

- Gather information from local residents and public regarding their experiences within the corridor as well as their ideas and objectives./

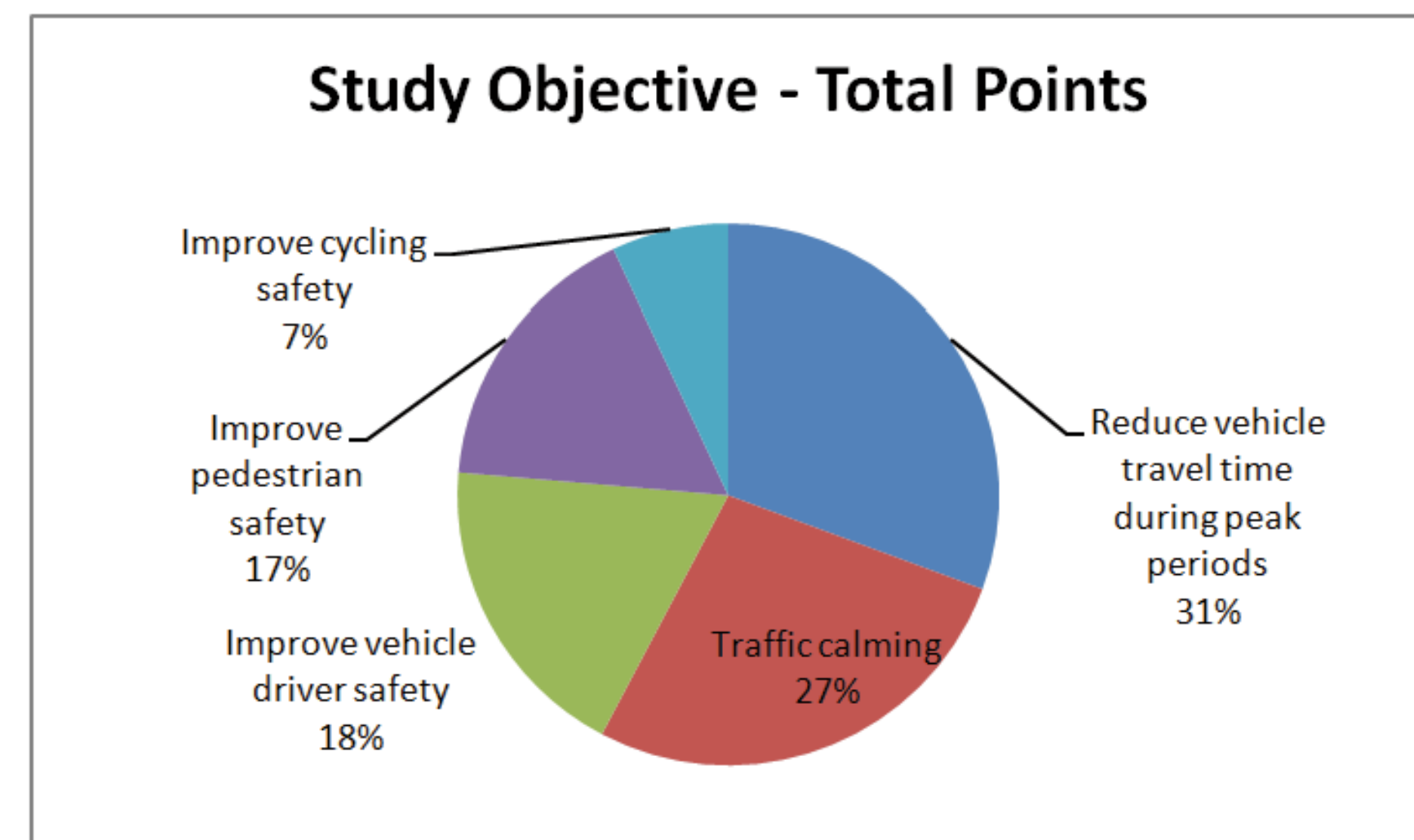
Model and Analyze Mitigation Options

- Bunt will examine impacts of various potential mitigation measures at multiple corridor intersections.
- Examine Open House #1 responses. Provide options to address public concerns.

Open House 1 Comment Results

47 Comment Sheets were filled in,. Results regarding primary corridor concerns are shown below.

Figure 1: Objectives for Corridor - Total Points

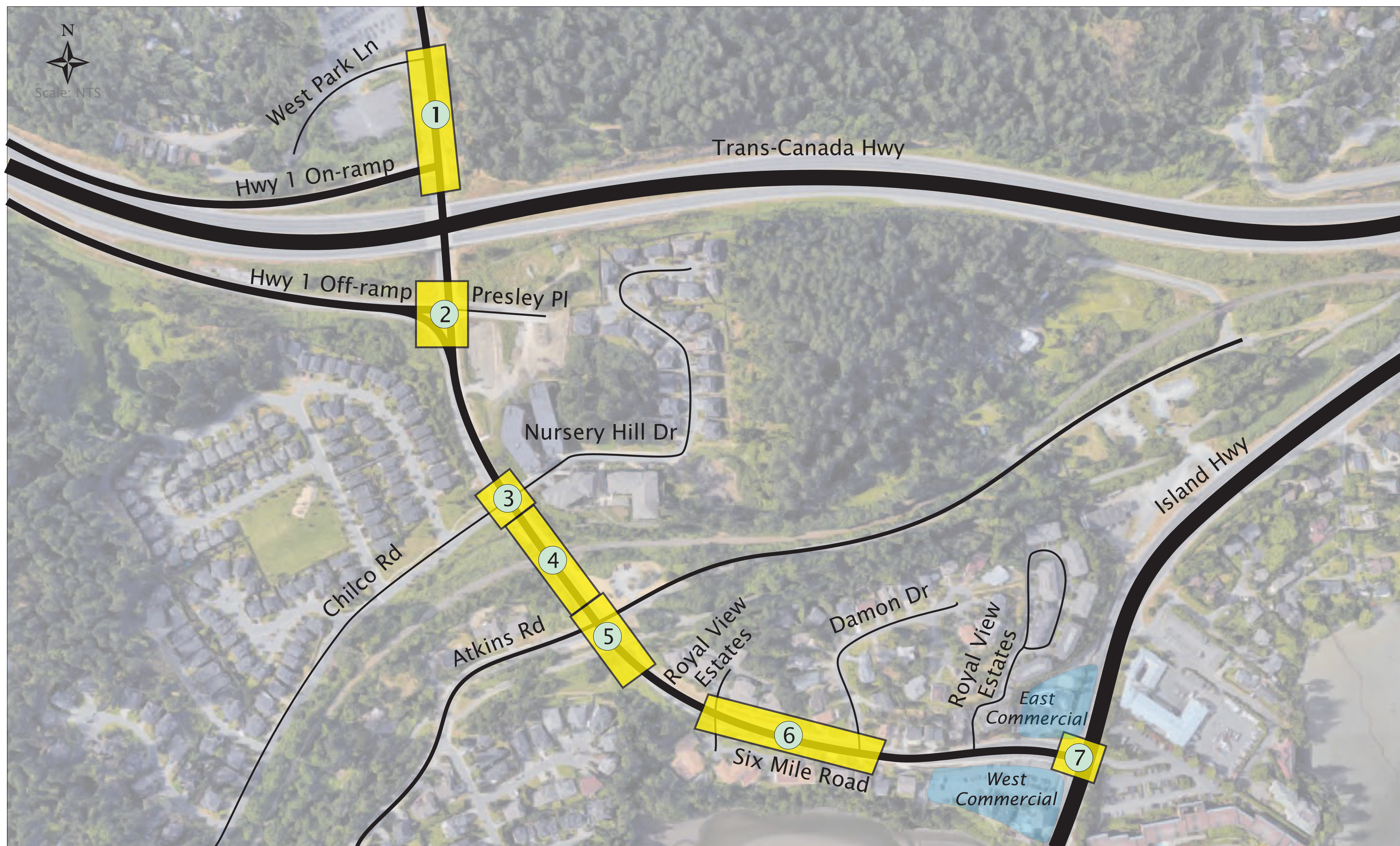


Open House #2 (October 29, 2019)

- Present **preliminary** recommendations, gather further input from residents.

Next steps

- Bunt will provide a Report detailing study methods, findings, and recommendations which will include priority projects informed by Open House 2 comments, costs and impact analysis.



Corridor Segments

Six Mile Road Corridor Study
04-19-0077 October 2019

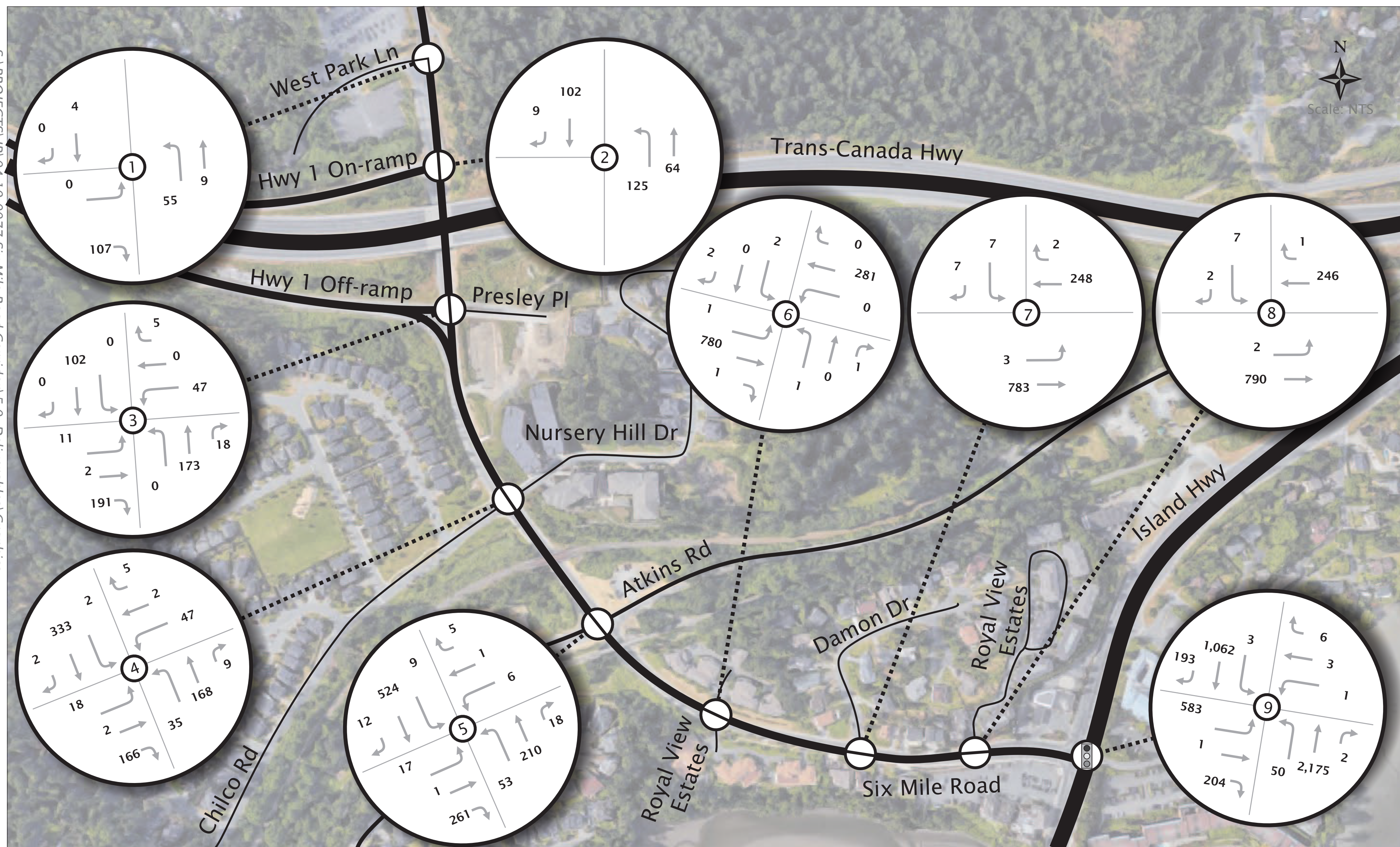
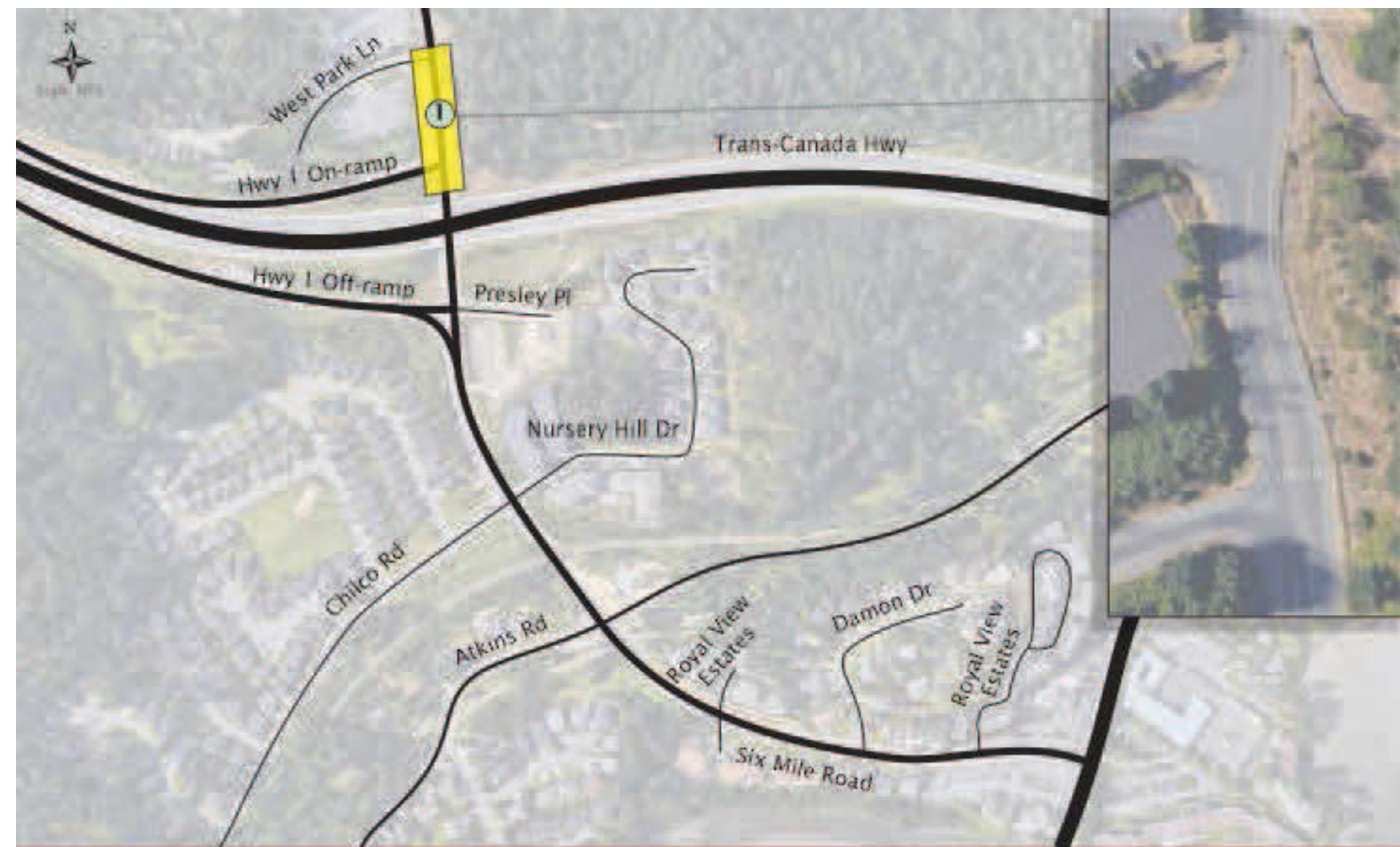


Exhibit 1 2022 Total AM Weekday Peak Hour Traffic Volumes

SEGMENT 1: SIX MILE ROAD NORTH OF HIGHWAY 1



Issues

- Pedestrian safety, particularly during summer months when Thetis Lake parking lot overflow results in vehicles parking along Six Mile Road.
- No pedestrian link on Six Mile Road between Highway 1 Off-Ramp and Thetis Lake parking lot area.

Analysis & Findings

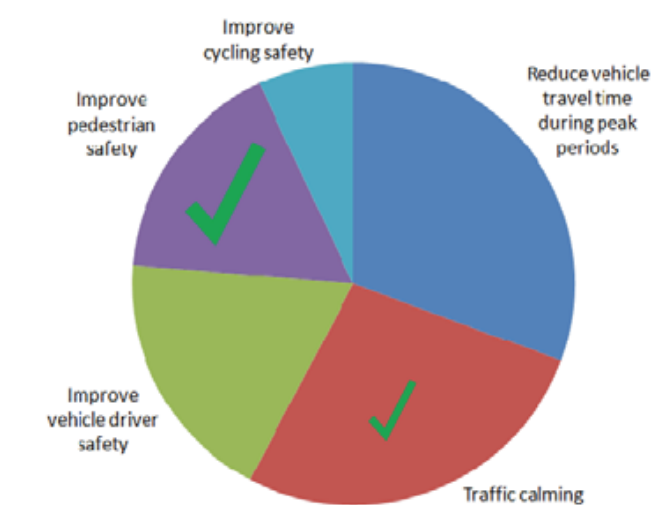
No traffic capacity issues forecasted at Highway 1 on-ramp & Six Mile Road intersection in existing or future analysis scenarios.

Recommendations

Improve pedestrian amenities along Six Mile Road's east edge.

Update: Sidewalk added to Six Mile Road's east edge in summer of 2019.

Photos: Facing South near West Park Lane



SEGMENT 2: SIX MILE ROAD & HIGHWAY 1 OFF-RAMP INTERSECTION

Issues

- Pedestrian safety during peak summer periods: crosswalk on intersection’s south leg could be upgraded to a Special Crosswalk with pedestrian activated buttons.
- No traffic capacity issues forecasted.

Analysis & Findings

Vehicles exiting Presley Place are not anticipated to encounter delays requiring mitigation as they turn onto Six Mile Road.

Pedestrian Crossing Options include:

A Signed and Marked Crosswalk: *Pedestrian crossing is permitted at marked and signed crosswalks. Marked crosswalks are installed to draw a driver’s attention to a crossing location and to indicate to pedestrians that the location is a good place to cross the road.*

A Special Crosswalk: *Special crosswalks also draw a driver’s attention to the needs of the pedestrians at the crosswalk. They are push button operated and usually reserved for more complex locations where a driver’s attention may be difficult to obtain with a signed and marked crosswalk.*

4.2.2 Pedestrian Crossing Warrant

The Pedestrian Crossing Control Manual for British Columbia (Ministry of Transportation) was used to examine pedestrian crossings. The warrant takes into account crossing time measured by crossing distance, crossing opportunities, which is a product of conflicting vehicle volumes, and forecasted pedestrian crossing demands. They also take into account stopping sight distances for approaching vehicles, proximity of adjacent traffic or pedestrian signals or crosswalks, and road geometry.

The existing pedestrian crossing has low pedestrian volumes during regular periods, however this increases during peak Thetis Lake periods. The two-lane profile of Six Mile Road with existing traffic volumes provides approximately 160 crossing opportunities per hour based on the future forecasted 2032 traffic volumes, as shown in **Figure 1**.

As shown in **Figure 2**, the crossing opportunity value of 160 crossing opportunities indicates that the crossing does not warrant a more robust crossing with push-button or overhead lights.

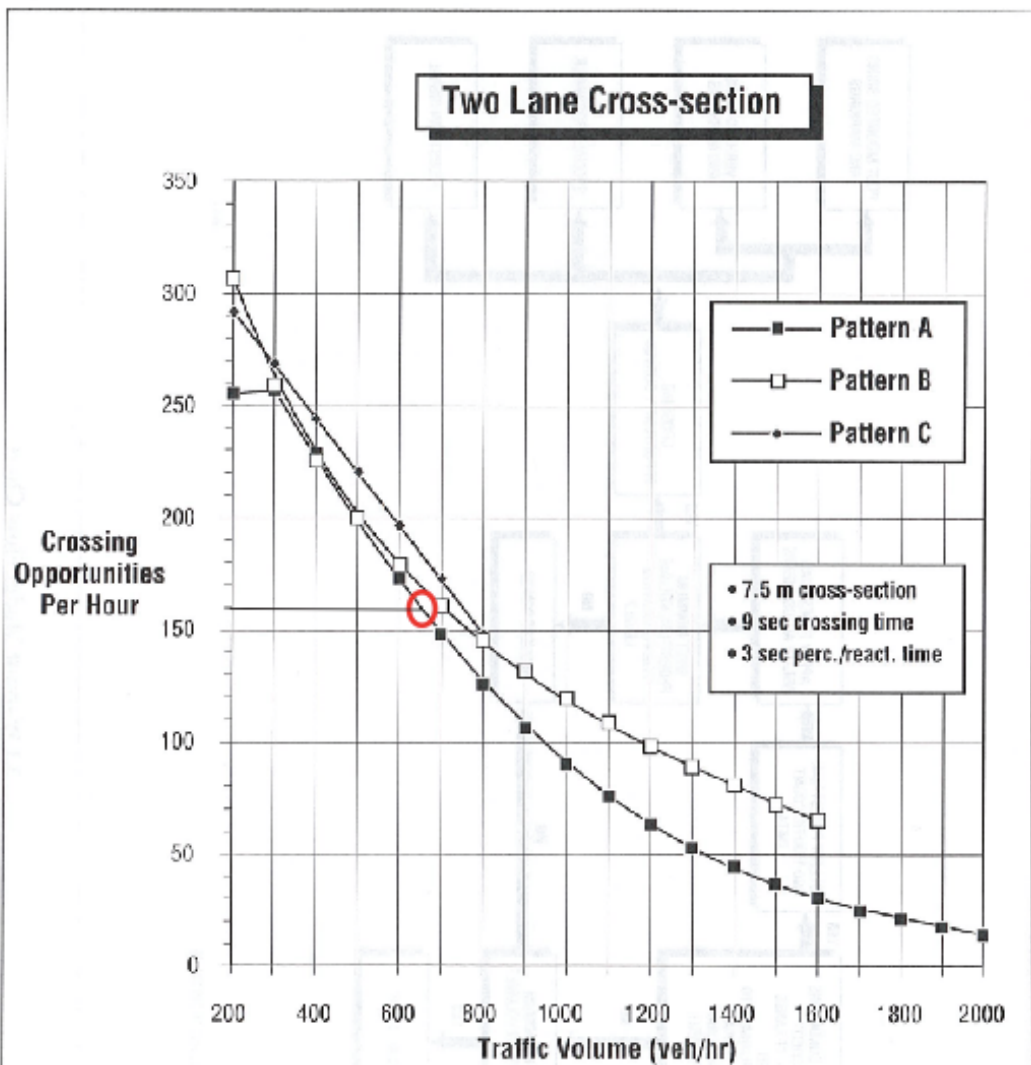
Recommendations

- No recommended changes.
- Upgrading the pedestrian crossing to a Special Crosswalk is not anticipated to be warranted due to low volumes of pedestrians crossing at this location and the relatively low volume of vehicle traffic.

Figure 1: TAC Pedestrian Crossing Warrant

Pedestrian Crossing Control Manual for British Columbia

Chapter: Warrants	Unit: April 1994
Figure: 3.5A	Page: 3-13



SEGMENT 3: CHILCO ROAD & SIX MILE ROAD INTERSECTION

Issues

- LOS E delays for vehicles turning onto Six Mile Road from Chilco Road and Nursery Hill Dive, particularly during the AM peak period.
- Pedestrian safety due to high vehicle speeds.

Analysis & Findings

Four potential traffic control options at the Chilco Road & Six Mile Road intersection were examined:

- Existing, 2-way stop control;
- 4-way stop control;
- Traffic signal (semi-actuated, uncoordinated); and
- Roundabout.

Chilco Road & Six Mile Road Operation Comparison –2032

SCENARIO	MOVEMENT	UNSIGNALIZED 2-WAY STOP (EXISTING)			4- WAY STOP			TRAFFIC SIGNAL			ROUNDAABOUT		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
AM	OVERALL	A	-	-	B	-	-	A	0.35	-	A	0.28	-
	EBL	C	0.06	0	A	0.04	15	B	0.09	5	-	-	-
	EBTR	B	0.28	10	A	0.29	15	B	0.12	10	A	0.20	10
	WBT	D	0.27	10	B	0.11	10	B	0.28	10	A	0.05	0
	NBL	A	0.03	0	A	0.07	15	A	0.06	5	-	-	-
	NBTR	A	0.11	0	A	0.31	20	A	0.18	15	A	0.15	5
	SBLTR	A	0.00	0	C	0.63	30	A	0.37	30	A	0.28	10
PM	OVERALL	A	-	-	C	-	-	A	0.41	-	A	0.36	-
	EBL	D	0.12	5	A	0.04	10	B	0.09	5	-	-	-
	EBTR	B	0.11	5	A	0.12	20	B	0.03	0	A	0.09	5
	WBT	E	0.30	10	B	0.10	20	B	0.22	5	B	0.05	0
	NBL	A	0.09	0	C	0.16	10	A	0.15	10	-	-	-
	NBTR	A	0.28	0	A	0.73	35	A	0.43	35	A	0.36	20
	SBLTR	A	0.01	0	C	0.73	30	A	0.30	20	A	0.34	15

Queue lengths are rounded to the nearest 5m.

4.2.3 Existing 2 Way Stop Control

With the existing 2-way stop control configuration the intersection is anticipated to operate within threshold criteria during both weekday AM and PM peak hour periods, but delays at minor legs approach problematic delays in future 2032 scenarios.

4.2.4 4-Way Stop Control

Conversion to 4-way stop control was examined. It was found to not result in traffic operation benefits. Instead, average intersection delays are increased due to substantially increased northbound and southbound delays.

4.2.5 Traffic Signal

A traffic signal at this location would decrease minor leg peak period delays (to LOS B) without significant impact to the major north / south movements (they remain at LOS A). However, a traffic signal is not warranted at this location using forecasted 2022 and 2032 vehicle volumes, according to TAC signal warrants (scores of 81, 83 / the 100 required points, in 2022 and 2032 respectively).

4.2.6 Roundabout

The Sidra analysis indicates that if the Chilco Road & Six Mile Road intersection is converted to a roundabout, it is anticipated to operate within delay and v/c thresholds. Generally, operations of a roundabout are shown to function similar to a traffic signal.

Recommendation

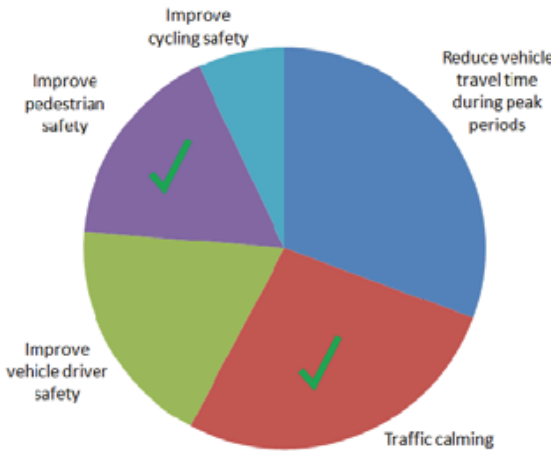
Monitor minor leg delays with build-out of residential area.

Short term, consider:

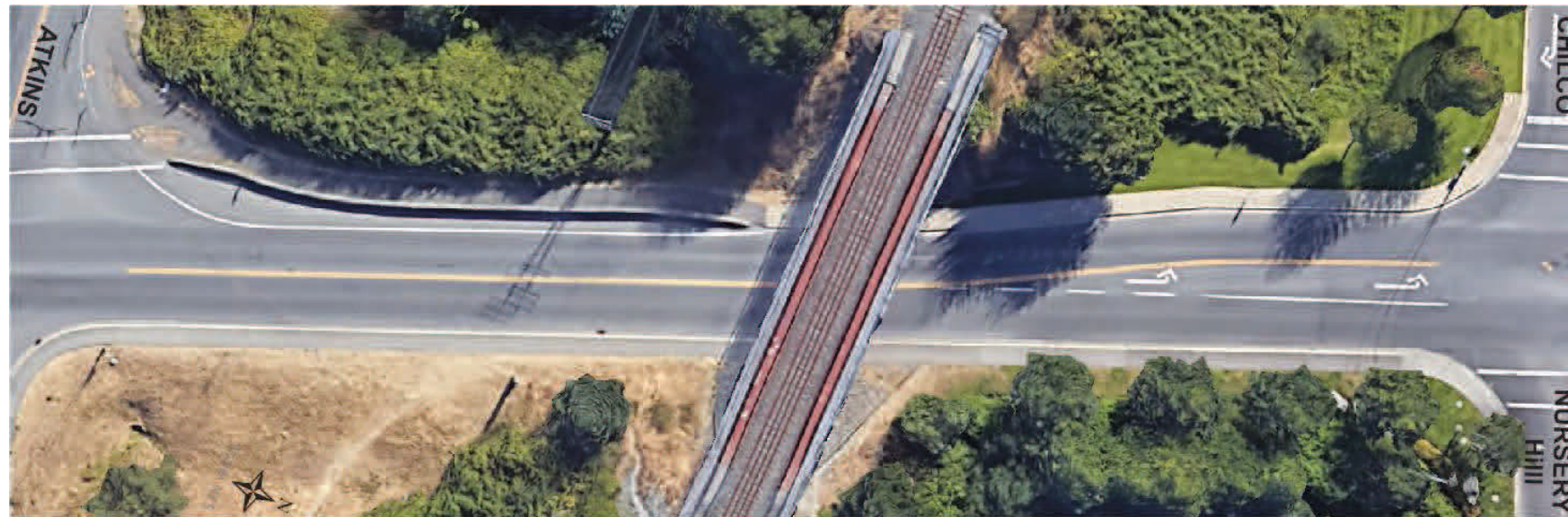
- Installation of pedestrian crossing upgrade including road narrowing and/ or central refuge median.
- Speed reader for southbound vehicles, north of Chilco Road.

Longer term, consider installation of a traffic signal for following reasons:

- Will act as a traffic calming measure for vehicles entering Six Mile Road from Highway 1 off-ramp.
- Will provide controlled crossing for pedestrians at this key pedestrian crossing point,
- Will reduce minor leg delays,
- A Traffic signal is not anticipated to create queues on Six Mile Road that extend to, or impact Highway 1 off-ramp.



SEGMENT 4: BETWEEN CHILCO ROAD & ATKINS ROAD



Issues

- Current cross section with vehicle and bicycle shared lanes present safety concerns.
- Six Mile Road under Rail Bridge narrows approximately to a 13.2 meter cross section.

Existing Cross Section

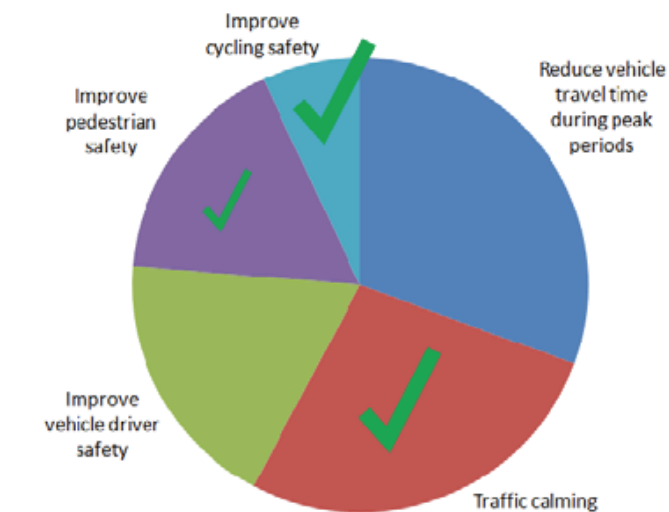


Analysis & Findings

- Key active transportation mode link between the Galloping Goose Trail and Chilco/ Nursery Drive residential areas.

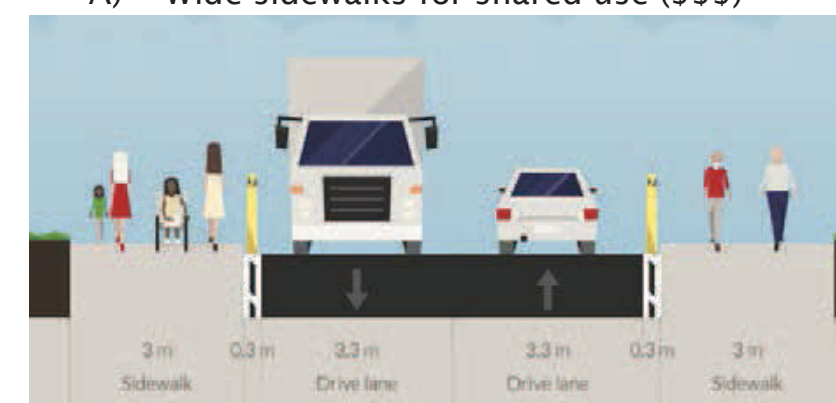
Recommendations

- Reduce travel lane width to create additional sidewalk/ cycling amenity.
- Prioritize barrier separating vehicles from sidewalk.
- Prioritize Six Mile Road's east edge, due to higher active mode volumes.
- Coordinate cross section alterations with potential alterations at Atkins Road & Six Mile Road intersection.



Cross Section Options (A & B Preferred)

A) Wide sidewalks for shared use (\$\$)



B) East edge alteration, one shared use sidewalk (\$\$)



C) One direction bike lane (\$)



D) No barriers between bikes and vehicles (\$\$\$)



SEGMENT 5: ATKINS ROAD & SIX MILE ROAD INTERSECTION

Issues

- Intersection exceeds capacity thresholds during AM and PM peak periods.
- There is no street level pedestrian crossing across Six Mile Road at the Atkins intersection.
- There is a missing pedestrian link between Six Mile Road’s western sidewalk and Galloping Goose Trail.

Analysis & Findings

Three potential traffic control options at the Atkins Road & Six Mile Road intersection were evaluated:

- Existing, 2-way stop control;
- Traffic signal (semi-actuated, uncoordinated); and,
- Roundabout.

Table 5.5: Atkins Road & Six Mile Road Operation Comparison - 2032

SCENARIO	MOVEMENT	UNSIGNALIZED (EXISTING)			SIGNAL			ROUNDABOUT		
		LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)	LOS	V/C	95TH Q (M)
AM	OVERALL	B			B	0.55		A	0.42	
	EBLTR	D	0.77	50	B	0.50	25	A	0.40	20
	WBLTR	F	0.20	5	B	0.03	5	A	0.01	0
	NBLTR	A	0.06	0	A	0.33	30	A	0.20	10
	SBLTR	A	0.01	0	A	0.57	70	A	0.42	20
PM	OVERALL	A			A	0.66		A	0.45	
	EBLTR	D	0.52	20	C	0.22	15	A	0.16	5
	WBLTR	F	0.62	25	C	0.30	15	A	0.09	5
	NBLTR	A	0.19	5	A	0.71	105	A	0.45	30
	SBLTR	A	0.00	0	A	0.39	35	A	0.44	20

Existing 2 Way Stop Control

With the existing 2-way stop control configuration, the intersection is anticipated to operate with westbound delays in excess of threshold criteria during both weekday AM and PM peak hour periods in the post-approved development 2022 (LOS E in AM, LOS F in PM) and future 2032 scenarios.

Traffic Signal

The introduction of a traffic signal would reduce problematic westbound delays to LOS B delays -10-15 seconds while maintaining northbound and southbound Six Mile Road corridor LOS A delays.

TAC Traffic Signal Warrants

INTERSECTION/ TIME PERIOD	VEHICLE SCORE	PEDESTRAIN SCORE	TOTAL SCORE	WARANTED
Atkins 2022	104	34	138	YES
Atkins 2032	123	35	158	YES

The intersection warrants a traffic signal according to TAC warrants.

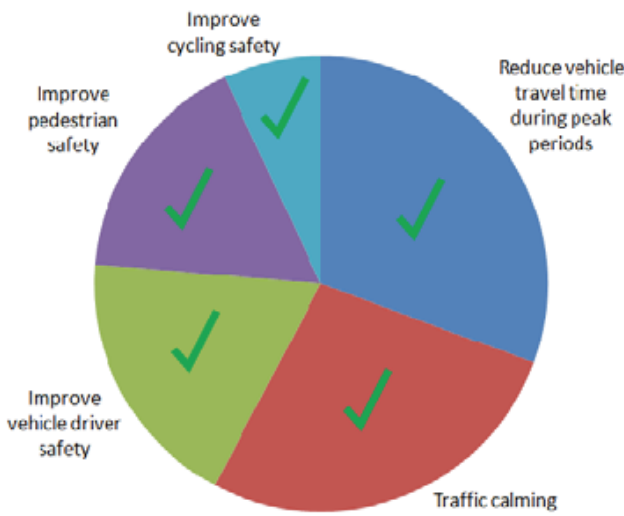
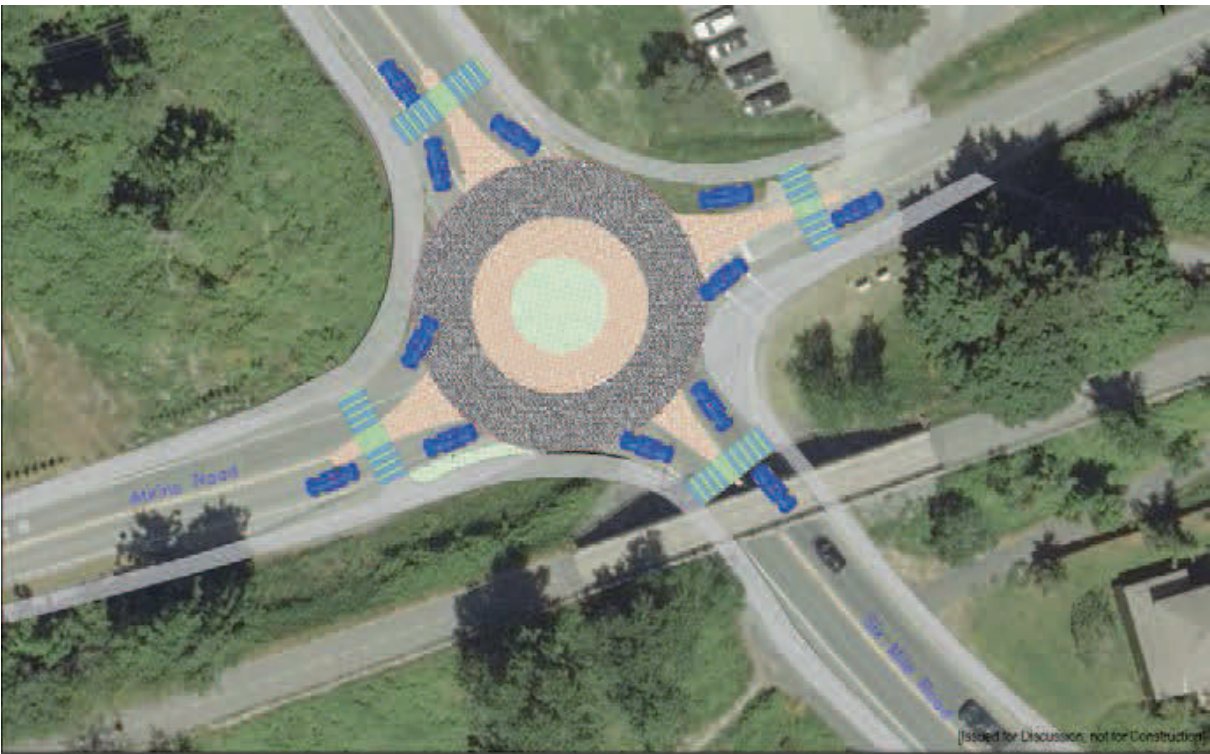
Roundabout

Roundabout results are shown to also reduce problematic minor leg delays, while maintaining northbound and southbound Six Mile corridor LOS A delays. Roundabout results in best vehicle operations.

Recommendation

A traffic signal and a roundabout were both shown to improve traffic operations. A roundabout is favored at this location as it is anticipated to result in:

- Minimal Six Mile Road corridor travel time impacts;
- Lower vehicle approach speeds on Six Mile Road; and,
- Prioritizes pedestrians and provides improved connection with adjacent Galloping Goose trail.



SEGMENT 6: MINOR ROAD RESIDENTIAL ACCESSSES ONTO SIX MILE ROAD



Issues

- Delays for vehicles turning from minor roads onto Six Mile Road during weekday AM peak period.
- No pedestrian crossings across Six Mile Road in this segment. Controlled pedestrian crossings at Galloping Goose and Island Highway are approximately 480 m apart. This equates to an approximate 5 minute walk. NACTO suggests that rerouting over 3 minutes is problematic as it often leads to jaywalking.

Analysis & Findings

Vehicles from exiting minor roads do not warrant traffic signal installation due to low vehicle volumes.

Pedestrian Crossing Options include:

A Signed and Marked Crosswalk: *Pedestrian crossing is permitted at marked and signed crosswalks. Marked crosswalks are installed to draw a driver's attention to a crossing location and to indicate to pedestrians that the location is a good place to cross the road.*

A Special Crosswalk: *Special crosswalks also draw a driver's attention to the needs of the pedestrians at the crosswalk. They are push button operated and usually reserved for more complex locations where a driver's attention may be difficult to obtain with a signed and marked crosswalk.*

4.2.7 Pedestrian Crossing Warrant

The Pedestrian Crossing Control Manual for British Columbia (Ministry of Transportation) was used to examine pedestrian crossings. The warrant takes into account crossing time measured by crossing distance, crossing opportunities, which is a product of conflicting vehicle volumes, and forecasted pedestrian crossing demands. They also take into account stopping sight distances for approaching vehicles, proximity of adjacent traffic or pedestrian signals or crosswalks, and road geometry.

BC Transit bus stops create the need for a Six Mile Road crossing.

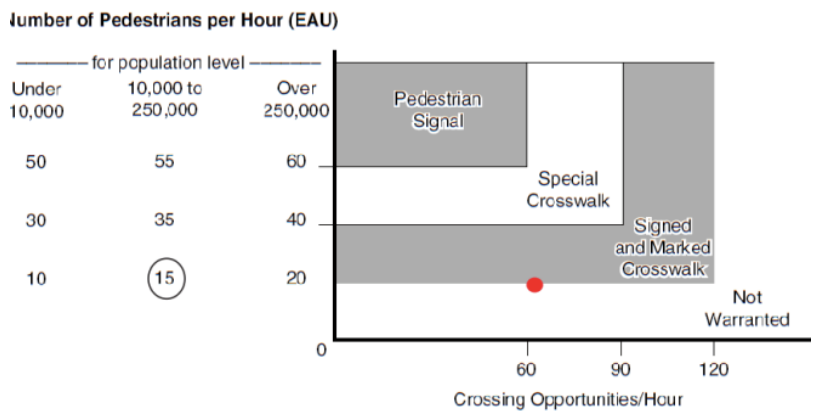
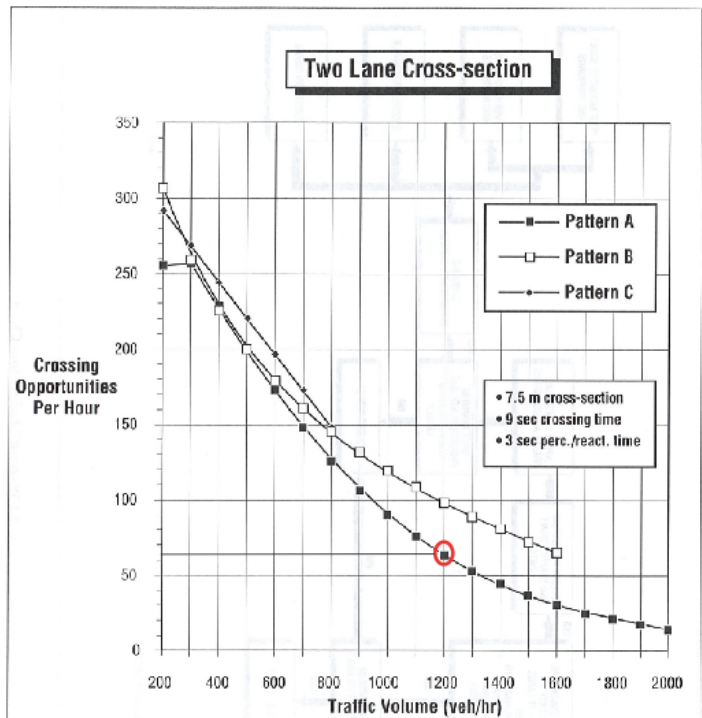
The two-lane profile of Six Mile Road with existing traffic volumes provides approximately 62 crossing opportunities per hour based on the future forecasted 2032 traffic volumes. This suggests if the mid-block demand was greater than 15 people per hour a Signed and Marked Crosswalk would be warranted.

Low bus stop service demand. Crossing demand is anticipated to be less than 15 pedestrians per hour.

Recommendations

No recommended changes. Approximate 480 m walking distance and low anticipated crossing demand.

Pedestrian Crossing Control Manual for British Columbia
 Chapter: Warrants
 Page: 3-5A
 Date: April 1994
 Page: 3-13



SEGMENT 7: ISLAND HIGHWAY & SIX MILE ROAD INTERSECTION

Issues

The Island Highway & Six Mile Road intersection demonstrates significant north leg (Six Mile Road approach) delays and corresponding queues in the weekday AM peak period. This left turn movement already has dual left turn lanes. Due to property lines and in consideration of the existing dual left turn lanes, this intersection is considered to be built out in terms of lanes and geometric alternatives.

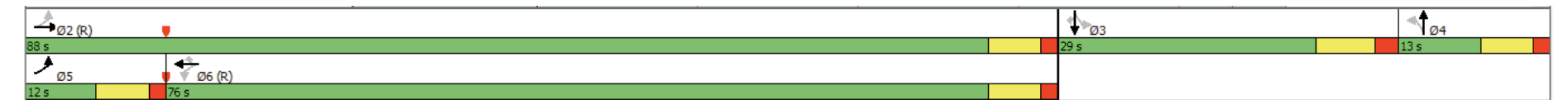
Screen Capture of AM SimTraffic Model Queues



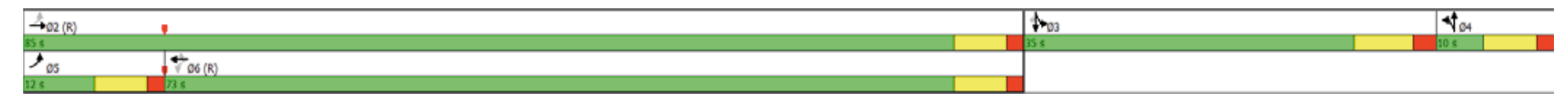
Analysis & Findings

- Changing the AM period signal timing plan can reduce delays for southbound vehicles while still allowing the opposing Island Highway's eastbound phase to meet capacity thresholds.
- Changing the PM period signal timing plan can reduce westbound through capacity while still allowing the opposing Six Mile Road southbound phase to meet capacity thresholds.
- Existing commercial access Six Mile Road hatching displaces left turn storage queue space.

2019 Weekday AM Period Phasing (116 cycle length)



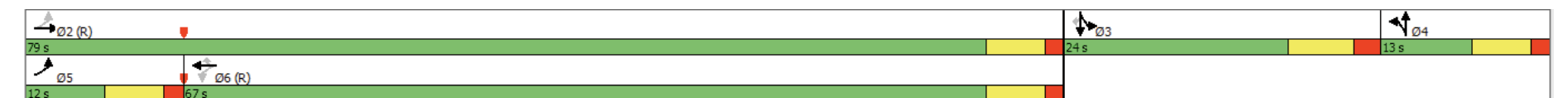
Recommended Weekday AM Phasing Optimization



2019 Weekday PM Period Phasing (116 cycle length)



Recommended Weekday PM Phasing Optimization



Recommendation

- Traffic signal optimization is considered the most practical mitigation measure. Analysis suggests extending the southbound left turn phase by six seconds in the weekday AM period. Correspondingly the westbound and eastbound phases should be reduced by three seconds and the northbound movement (from Water's Edge) should be reduced by three seconds. 6-10 more vehicles anticipated to travel through each signal cycle or approximately 160 to 260 vehicles per peak hour. Also extends pedestrian walk phase.
- Our analysis suggests the traffic signal can also be improved during the PM peak hour period by extending westbound phase by five seconds. Correspondingly, the southbound phase should be reduced by five seconds.
- This is a low cost item compared to impact and can be implemented in short term.

Update: These signal timing changes were implemented on October 18th, 2019. Monitoring of impact is currently ongoing.

