STRATHCONA COUNTY

Sherwood Drive and Broadmoor Boulevard Traffic Circle Report

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Executive Summary

A three-year traffic study has been underway to assess the ongoing traffic safety impacts at the traffic circle intersection of Sherwood Drive and Broadmoor Boulevard as requested following the Council motion: “THAT Administration, in consultation with the Traffic Safety Advisory Committee, undertake a traffic review of traffic circle on Broadmoor Boulevard and Sherwood Drive and provide recommendations on improving traffic flow and safety for Council’s consideration by the end of the second quarter of 2019.

The traffic circle on Broadmoor Boulevard and Sherwood Drive was identified as an intersection of significant concern through routine network screening due to an increasing trend of vehicle collisions. Al-Terra Engineering was retained in 2015 as an independent contractor to undertake a detailed review of collisions and traffic operations as well as to conduct public engagement and to capture internal Strathcona County stakeholder’s feedback. Al-Terra’s recommended interim design was chosen as the preferred, low cost option to improve safety until the intersection and roads required lifecycle replacement and rehabilitation. The interim option was implemented by the end of May 2016. It is understood that the original design of the traffic circle was developed in 1973 and does not conform to current design practices and that a complete reconstruction is ultimately required to improve overall operations and driver understanding in the long-term.

This report assesses and analyzes the traffic circle from June 1, 2016 to May 31, 2019 and compares collision data obtained prior to the 2016 intersection modifications. This three-year review outlines operational conditions, outcomes, and recommendations to maintain efficient traffic operations and safety until the intersection requires lifecycle replacement and rehabilitation when a modern design will be developed and implemented in a more cost-effective manner.

Prior to the changes, the number of reported collisions was outside of acceptable levels and Strathcona County had a duty of care to improve operating conditions and safety for all road users. Based upon the observed operation, collision review, and a predictive video modeling study, the number of collisions has been reduced 48% overall and 76% for 2018 as a result of the interim safety improvements changes completed in May 2016. This reduction in collisions has made the traffic circle one of the lowest arterial road intersections for collisions and is now operating better than expected when compared to similar traffic circles throughout the capital region.

At this time, no additional changes or improvements to the Sherwood Drive and Broadmoor Boulevard traffic circle are recommended. Upon review of the safety evaluation and consideration of potential options “the Traffic Safety Advisory Committee recommends to Council the traffic circle be considered for redesign and reconstruction upon regular rehabilitation of the road as deemed necessary by Strathcona County with a proper review cost/benefit analysis”. Current asset management reports are indicating that the pavement structure and quality will require replacement within 6 to 10 years.

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Introduction

The traffic circle on Broadmoor Boulevard and Sherwood Drive was identified as a high-risk intersection during routine network screening due to an increasing trend of vehicle collisions. Al-Terra Engineering was retained in 2015 as an independent contractor to undertake a detailed review of collisions and traffic operations as well as conducting public engagement and capturing Strathcona County stakeholder's feedback. The Al-Terra review developed and assessed various long-term and interim design options to address identified safety and collision issues.

In 2016, Al-Terra's recommended interim design option was chosen as the preferred, low cost option to address issues until the intersection and roads required lifecycle replacement and rehabilitation. The recommended intersection modifications were implemented by the end of May 2016. It is understood that the original design of the traffic circle was developed in 1973 and does not conform to current design practices and that a complete reconstruction will ultimately be required to accommodate future operational needs and safety expectations.

This report summarizes the traffic safety assessments through the analysis of the traffic circle from June 1, 2016 to May 31, 2019 and compares safety data obtained prior to the 2016 intersection modifications. This three-year review outlines operational conditions, outcomes, and recommendations to maintain efficient traffic operations and safety until the intersection requires lifecycle replacement and rehabilitation when a modern design can more cost-effectively be developed and implemented in alignment with budget priorities.

Purpose and goals

Purpose

Review collision history over the past three years to evaluate the safety impacts of the interim traffic circle modifications and to develop recommendations for the continued infrastructure operation and management of the Sherwood Drive and Broadmoor Boulevard traffic circle.

Goals

Define and discuss traffic operations and safety in relation to the interim traffic circle modifications and develop recommendations until the traffic circle is reconstructed to modern standards.

Background

Sherwood Drive is a four-lane divided, urban arterial road with a posted speed limit of 60 km/h, running north/south from Wye Road to Highway 16. Broadmoor Boulevard is a four-lane divided, urban arterial road with a posted speed limit of 60 km/h, running north/south from the Sherwood Drive traffic circle to Highway 16. The Sherwood Drive traffic circle was designed in 1973 and constructed in 1977. At the time the traffic circle was designed and engineered to the most current

standards and best practices in engineering and was an innovative solution to the complex intersection created at the arterial-to-arterial intersection.

The intersection is a three-legged traffic circle. Although some of the geometrics of the traffic circle do not conform to current roundabout theory and design practices, the intersection has functioned acceptably for the past four decades. In the five years (2010 – 2014) prior to alterations being made there was a notable and measurable increase in the number of collisions at the intersection, specifically when compared to the overall traffic volumes. As a result, Strathcona County created a public proposal to have an independent transportation engineering consultant undertake an operational assessment of the existing intersection and develop conceptual design alternatives for long-term and interim scenarios; Al-Terra Engineering was the selected consultant.

In addition to the engineering assessment conducted by Al-Terra, an online survey was administered to understand the public's opinions and concerns about the operation of the traffic circle. Through the engagement, 2,260 people contributed their input, the highest number of responses to a survey ever recorded in Strathcona County previously. There was a strong sentiment from residents (>80%) that they valued the effective flow of the traffic circle and did not want to see it converted to a signalized intersection. By far the most common response on what could be improved at the traffic circle was improving driver behaviour and education. Many responses indicated that poor driver behaviour at the intersection was the result of lack of driver understanding of the rules of the road. Other respondents felt that poor driver behaviour was likely tied to the geometry of the circle or the lack of directional and informational way finding signs to navigate the traffic circle.

The engineering review showed that the traffic volumes were well within operational capacity of the intersection; therefore, the review focused on mitigating current safety issues with potential interim and long-term reconstruction alternatives. Al-Terra's 2015 report recommended the implementation of cost-effective interim modifications to the traffic circle, with the long-term full reconstruction and roundabout modernization option as the preferred ultimate option when combined with scheduled road rehabilitation.

The recommended low-cost interim changes to the traffic circle were completed by the end of May 2016. In order to fully assess the impacts and effects of the intersection modifications, Al-Terra Engineering recommended five years of collision data be captured for a relevant comparison and evaluation. As public concern was significant over the implemented changes, Council requested a review of a minimum of three years to make recommendations.

Through the review process a consultant (Fireseeds North) was retained to conduct before and after road safety video analytics to attempt to diagnose intersection risk factors from overhead video recordings of the traffic circle. This advanced technology assesses potential collisions through video analytics to better understand and identify collision conflict points that are known to lead to collisions.

The complete three-year, before and after intersection review and report is intended to provide enough information to inform the short and long-term recommendations for the continued operation of the intersection.

Engineering review

Interim intersection modifications

The recommended interim intersection modifications were implemented by the end of May 2016. Modifications included the installation of large information and directional signs, lane marking signs, upgraded yield signs with constant flashing amber beacons on the northbound approach, the elimination of the inside through lane northbound to Sherwood Drive, and the removal of trees creating sightline restrictions. Figure 1 shows the interim plan as designed and recommended by Al-Terra Engineering.

Figure 1: interim traffic improvement design plan

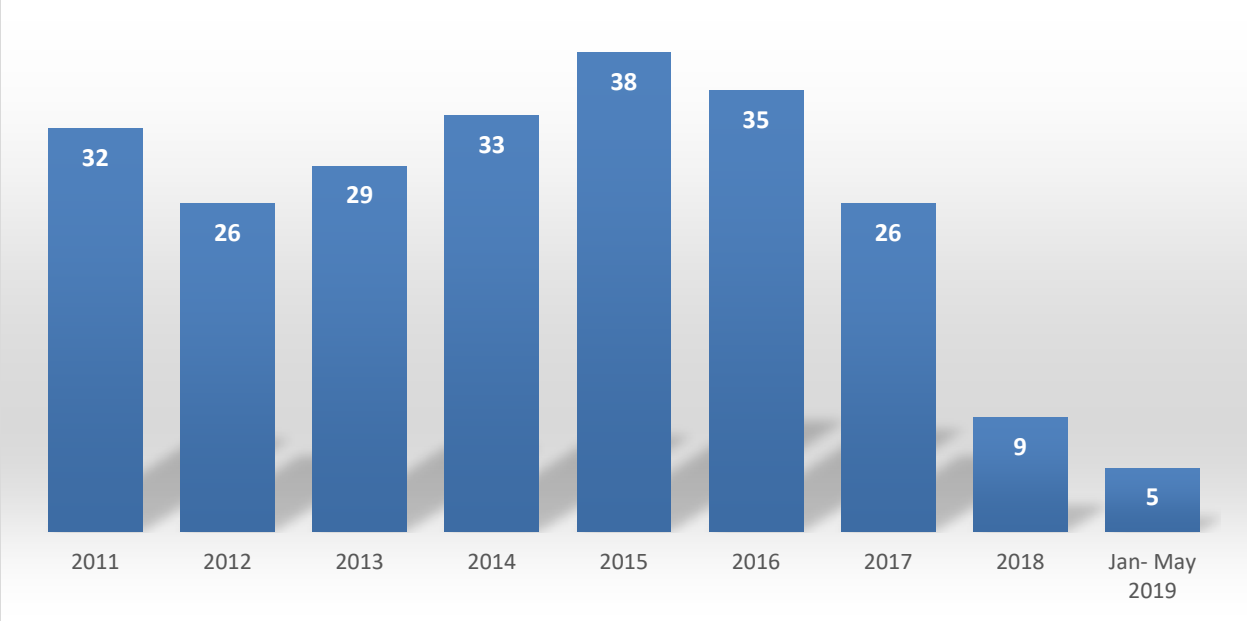
Collision history review – before and after

There were several studies conducted over the past number of years. Table 1 shows the number of collisions three years before and after the changes were made. The number of collisions has been significantly reduced since June 2016.

	Before (June 13-May 16)	After (June 16-May 19)	% Change
Total	105	55	-47.62
Major Injury	1	0	-100.00
Minor Injury	34	20	-41.18
Property Damage Only	70	35	-50.00

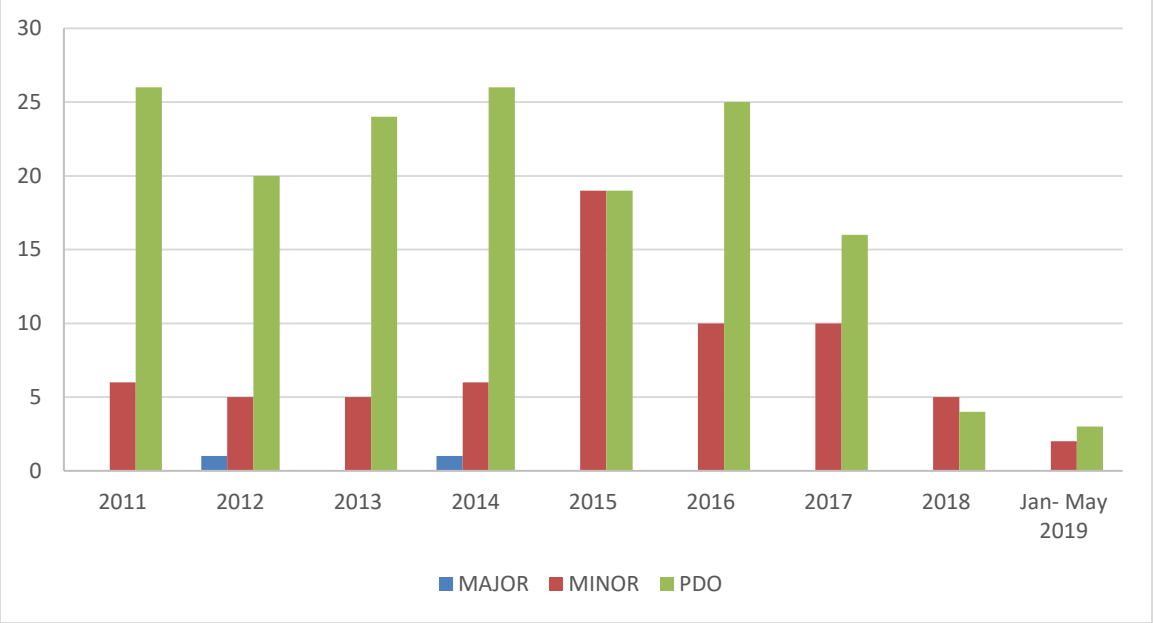
Table 1: collision comparison (before and after)

Graph 1 below shows overall collisions in a calendar year since 2011. There were 38 collisions in 2015, representing the highest in the history of the traffic circle's operation. In comparison, nine collisions were reported in 2018 and is the lowest recorded number on record. From the chart below, it is evident that there is a measurable decline in the number of collisions since the changes were made in 2016.



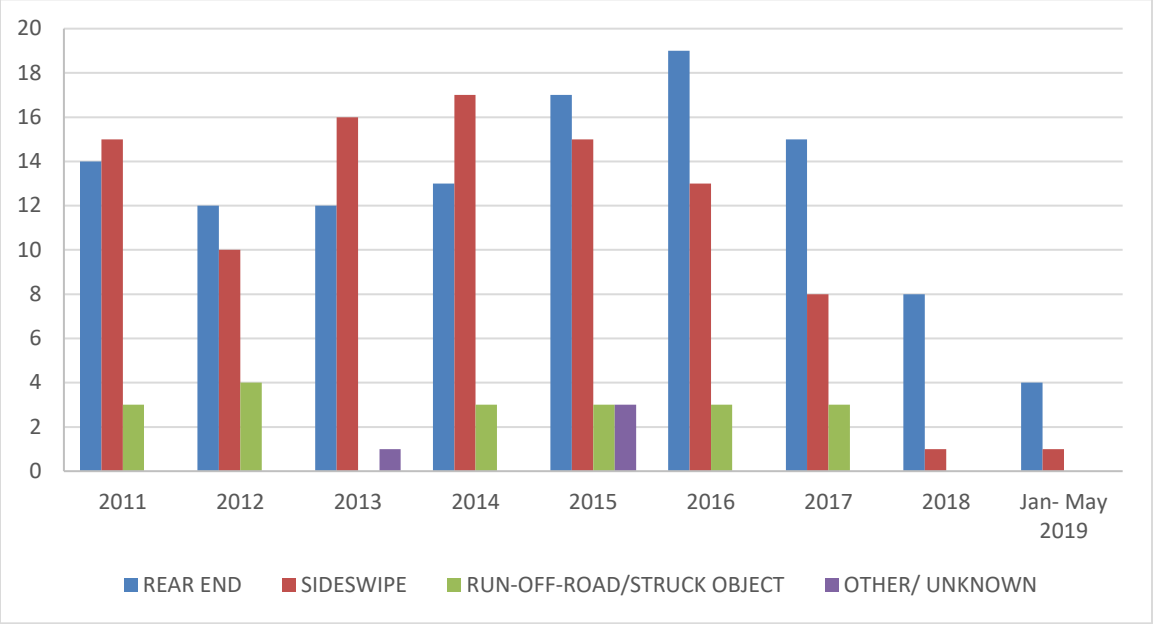
Graph 1: total collisions per year

Graph 2 shows the collision history by severity of collisions. 2015 has the highest number of minor injury collisions, with two major injury collisions. One serious injury occurred in 2012 and the other was in 2014, there have been no major injury collisions reported since 2014.



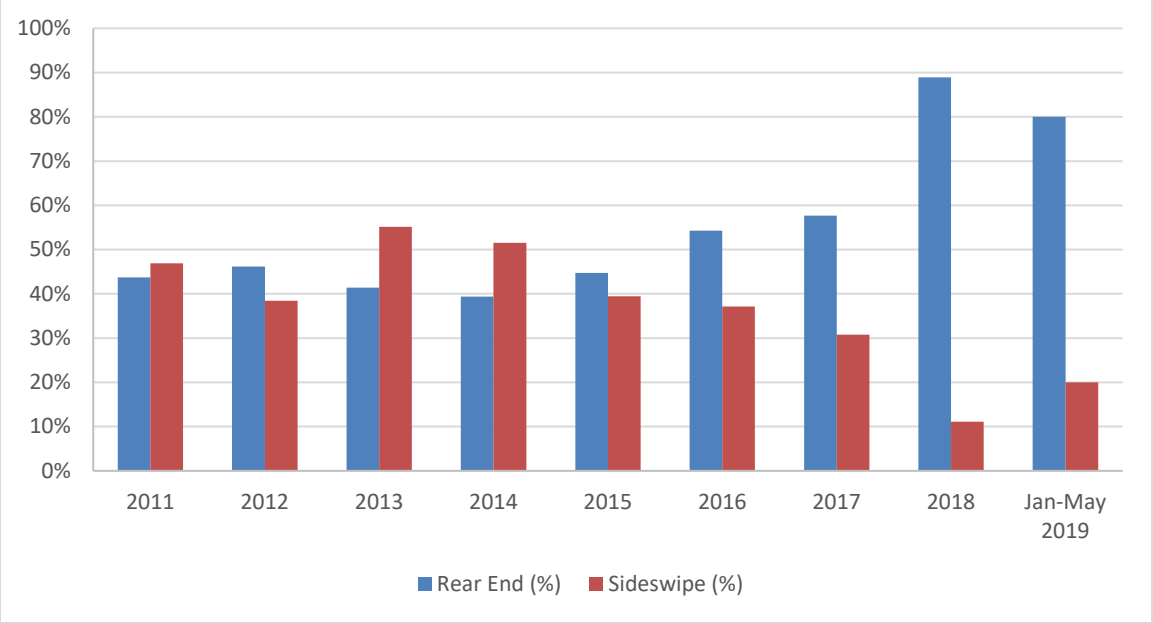
Graph 2: collisions by severity

Graph 3 shows the collisions by type since 2011, in reviewing the collision history by type of collision, sideswipes are assumed to be in the same direction and have significantly reduced from 17 in 2014 to one in 2018. Similarly, rear end collisions dropped from 19 in 2016 to eight in 2018.



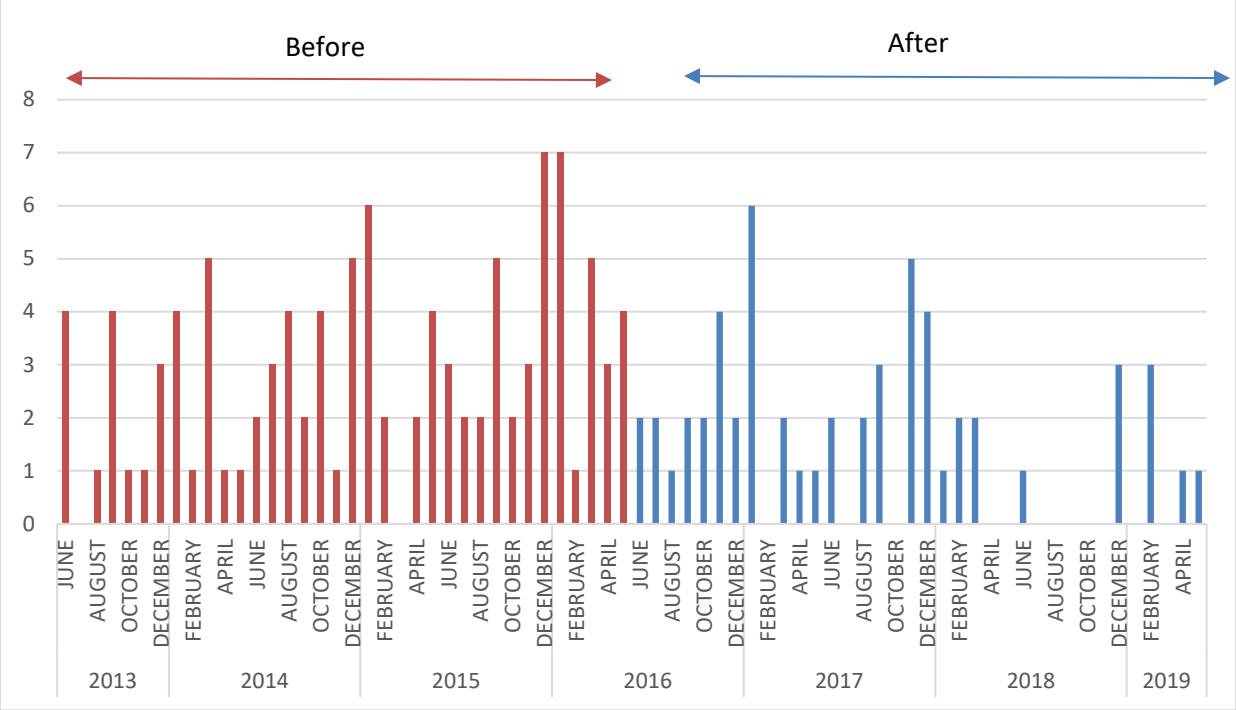
Graph 3: collisions by type

Graph 4 shows the percentage of Rear End and Sideswipe Same Direction collisions since 2011. Rear End and Sideswipe Same Direction collisions were almost equal prior to the change in May of 2016, and the percentage of sideswipe collisions has dropped compared with the rear end collisions in the three year after period.



Graph 4: rear end and sideswipe collision percentages

Graph 5 shows the monthly variations in the collision frequency three years before and three years after the changes were made. Collisions were generally higher in the colder months as drivers were recorded as having lost control on slippery road surfaces, resulting in rear end collisions. There were seven collisions reported in each month of December 2015 and January 2016, which was the highest in three years before the change. When reviewing the after period, December 2016 recorded six collisions, December 2017 recorded five collisions, and the most recent, December 2018 recorded three collisions.



Graph 5: collision frequency by month

Traffic volumes have been collected several times in the past, Table 2 below shows traffic volumes for each approach. Looking at the table below, the volume of traffic has not varied significantly since 1993 with only slight variations. Variations in traffic volumes may be attributed to seasonal and daily fluctuations or be due to major construction in the area such as the Anthony Henday and only represent a snapshot in time on the days that data was collected.

Table 2 shows the number of vehicles entering the traffic circle in 1993, 1994, 2000, 2014, 2015, 2017 and 2019 and the total number of reported collisions in the same time period. Traffic volume data collected in 2004 and 2014 shows that the number of vehicles using the circle is approximately the same as in 1993.

Year	NB	SB	WB	Veh/Day	Collisions	Collision Rate/Million Vehicles
1993	13,050	12,376	8,898	34,324	14	1.12
2000	11,546	10,898	8,116	30,560	22	1.97
2013	11,546	10,898	12,357	34,801	29	2.28
2014	12,787	12,507	7,627	32,921	33	2.75
2015	11,567	10,985	6,858	29,410	38	3.54
2016	11,565	11,010	7,194	29,769	35	3.22
2017	11,564	11,035	7,530	30,129	26	2.36
2018	11,953	10,529	6,765	29,247	9	0.84
2019	12,342	10,024	6,001	28,367	5*	1.17

Table 2: collision rates by year (*January – May 2019)

Collisions were reviewed for all intersections to highlight the top 10 intersections according to overall frequency between 2013 and 2015 and are summarized in Table 3. This ranking showed the traffic circle as the 3rd highest collision frequency intersection in Strathcona County.

Rank	Intersections	Major	Minor	PDO	Total
1	Baseline Rd/Sherwood Dr	1	41	80	122
2	Baseline Rd/Broadmoor Blvd	2	33	69	104
3	Sherwood Dr/Broadmoor Blvd	1	29	71	101
4	Baseline Rd/Clover Bar Rd	0	28	61	89
5	Wye Rd/Sherwood Dr	1	21	48	70
6	Baseline Rd/Shivam Rd	0	21	45	66
7	Wye Rd/Ordze Rd	1	13	42	56
8	Sherwood Dr/Fir St	3	11	42	56
9	Baseline Rd/17 St	1	11	42	54
10	Lakeland Dr/Broadmoor Blvd	0	16	37	53

Table 3: intersections rankings by frequency (2013-2015)

When compared to the number of vehicles entering the intersection, the Sherwood Drive traffic circle is the number one highest collision frequency intersection based upon the rate of collisions for the same time period between 2013 and 2015.

Rank	Intersections	Collisions (2013-2015)	Avg. Daily Traffic	Collision Rate / Million Vehicles
1	Sherwood Dr/Broadmoor Blvd	101	32,921	2.80
2	Baseline Rd/Shivam Rd	66	24,378	2.47
3	Baseline Rd/Clover Bar Rd	89	43,475	1.87
4	Baseline Rd/Sherwood Dr	122	63,650	1.75
5	Lakeland Dr/Broadmoor Blvd	53	28,382	1.71
6	Baseline Rd/Broadmoor Blvd	104	62,046	1.53
7	Sherwood Dr/Brentwood Blvd	41	26,247	1.43
8	Sherwood Dr/Fir St	56	36,175	1.41
9	Wye Rd/Sherwood Dr	70	45,264	1.41
10	Lakeland Dr/Clover Bar Rd	46	31,875	1.32

Table 4: intersection rankings by collision rates (2013-2015)

An analysis of the type and location of collisions at the traffic circle varied and are shown in Figure 2.

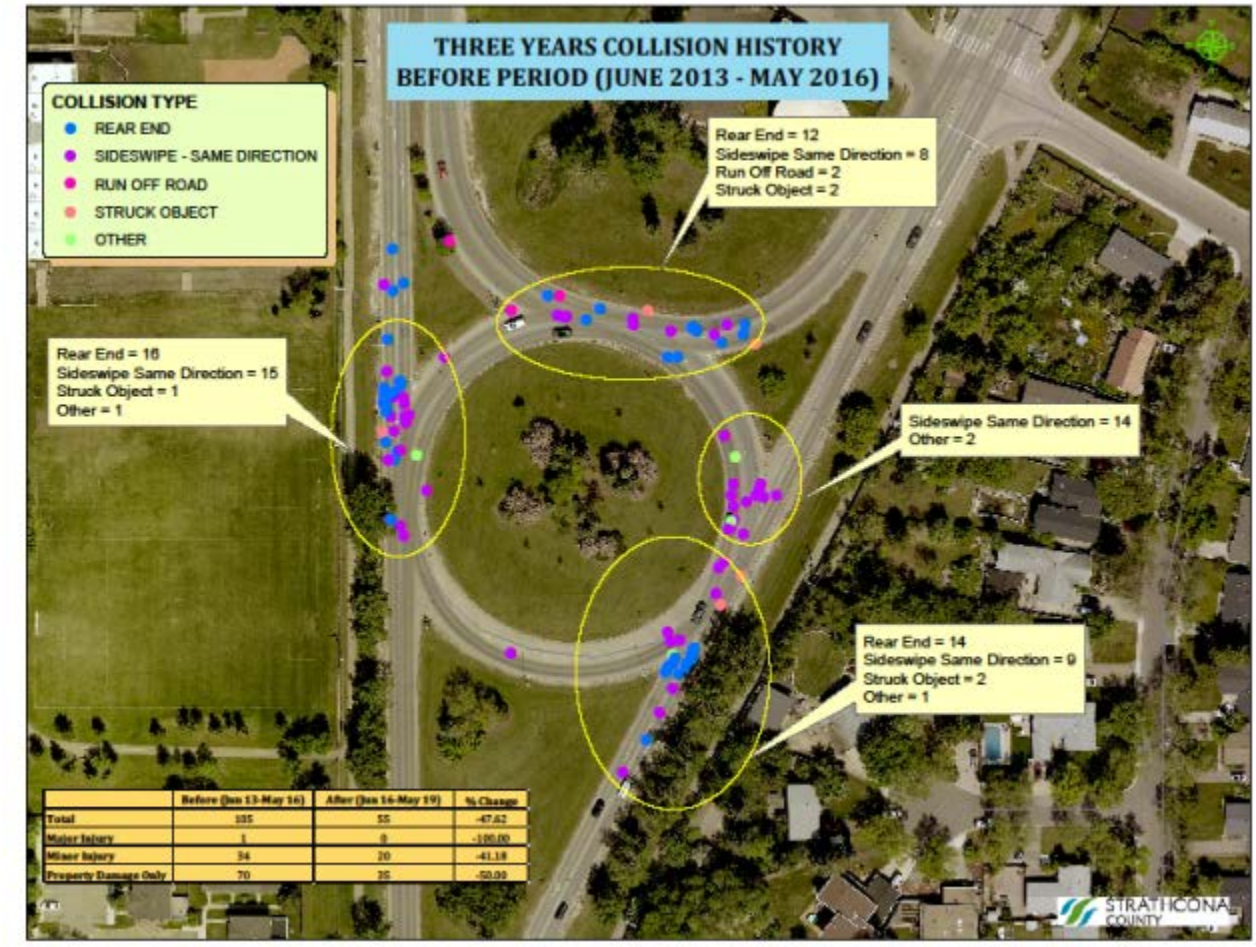
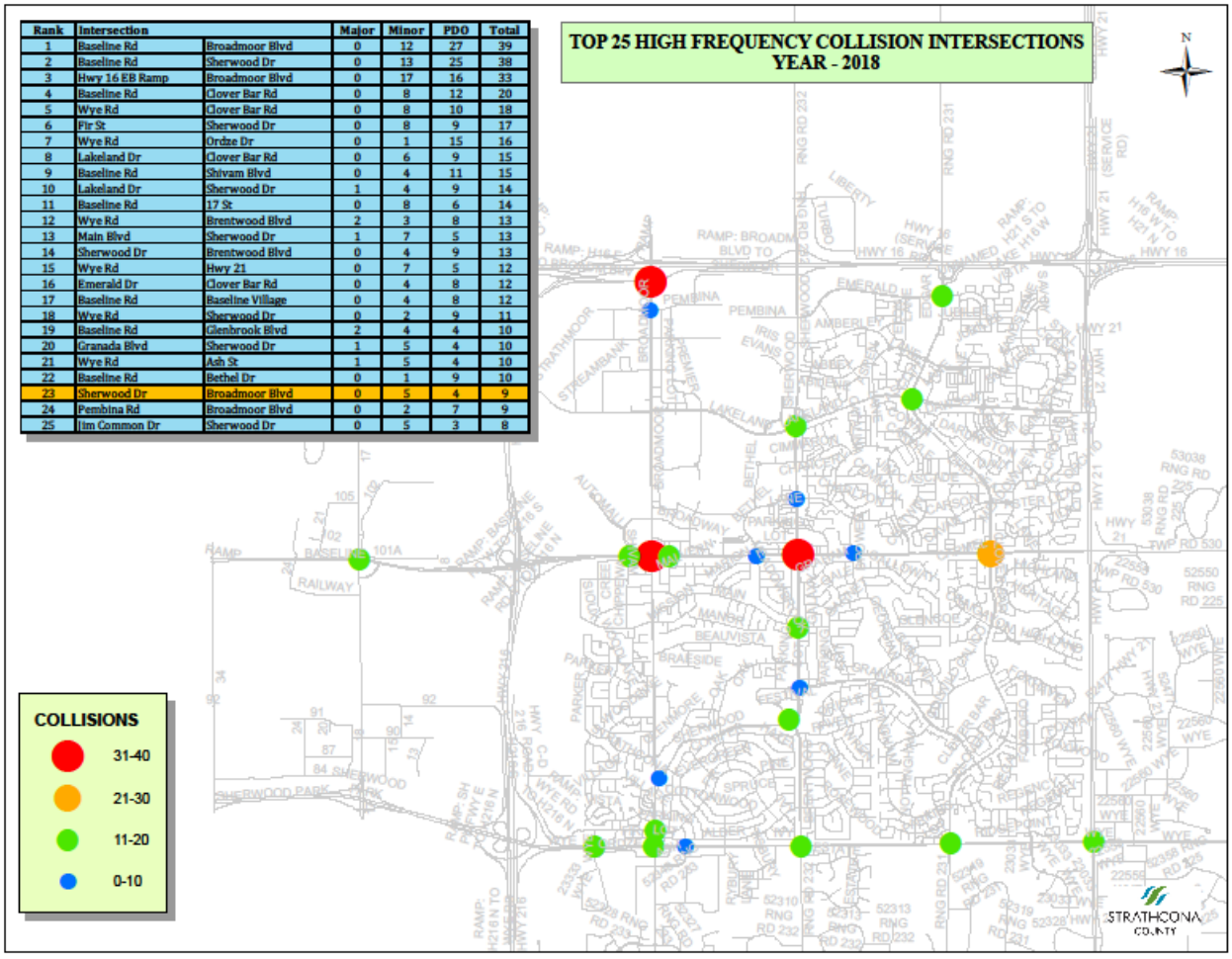


Figure 2: collision location map June 2013 – May 2016

As shown in Figure 2 many collisions occurred inside of the traffic circle which is unusual for traffic circle and roundabout intersections and therefore can more than likely be attributed to the unique design. When compared to the three years after, the intersection was modified, the collision frequency and location highlights significant improvement. Figure 3 identifies the top 25 collision frequency locations for 2018 while Figure 4 depicts the collision locations for the modified traffic circle.



Rank	Intersection		Major	Minor	PDO	Total
1	Baseline Rd	Broadmoor Blvd	0	12	27	39
2	Baseline Rd	Sherwood Dr	0	13	25	38
3	Hwy 16 EB Ramp	Broadmoor Blvd	0	17	16	33
4	Baseline Rd	Clover Bar Rd	0	8	12	20
5	Wye Rd	Clover Bar Rd	0	8	10	18
6	Fir St	Sherwood Dr	0	8	9	17
7	Wye Rd	Ordze Dr	0	1	15	16
8	Lakeland Dr	Clover Bar Rd	0	6	9	15
9	Baseline Rd	Shivam Blvd	0	4	11	15
10	Lakeland Dr	Sherwood Dr	1	4	9	14
11	Baseline Rd	17 St	0	8	6	14
12	Wye Rd	Brentwood Blvd	2	3	8	13
13	Main Blvd	Sherwood Dr	1	7	5	13
14	Sherwood Dr	Brentwood Blvd	0	4	9	13
15	Wye Rd	Hwy 21	0	7	5	12
16	Emerald Dr	Clover Bar Rd	0	4	8	12
17	Baseline Rd	Baseline Village	0	4	8	12
18	Wye Rd	Sherwood Dr	0	2	9	11
19	Baseline Rd	Glenbrook Blvd	2	4	4	10
20	Granada Blvd	Sherwood Dr	1	5	4	10
21	Wye Rd	Ash St	1	5	4	10
22	Baseline Rd	Bethel Dr	0	1	9	10
23	Sherwood Dr	Broadmoor Blvd	0	5	4	9
24	Pembina Rd	Broadmoor Blvd	0	2	7	9
25	Jim Common Dr	Sherwood Dr	0	5	3	8

Figure 3: Top 25 collision frequency intersections 2018

As shown in Figure 3, the Sherwood Drive and Broadmoor Boulevard traffic circle is now ranked as the 23rd intersection for collision frequency from the number three collision frequency location prior to the modifications. Based upon the number of reported collisions over the past three years, the number of collisions has been reduced by 48% over the three-year period and 76% comparing 2015 to 2018 and can be attributed directly with the interim safety improvements implemented in 2016. Table 5 shows that the traffic circle improved from the number one collision rate location for the number of vehicles entering the intersection to the twentieth.

Rank	Intersection		Major	Minor	PDO	Total	Traffic Volume	Rate/Million
1	Hwy 16 EB Ramp	Broadmoor Blvd	0	17	16	33	20,300	4.45
2	Baseline Rd	Broadmoor Blvd	0	12	27	39	66,200	1.61
3	Baseline Rd	Sherwood Dr	0	13	25	38	64,600	1.61
4	Wye Rd	Clover Bar Rd	0	8	10	18	31,500	1.57
5	Wye Rd	Hwy 21	0	7	5	12	23,900	1.38
6	Emerald Dr	Clover Bar Rd	0	4	8	12	24,900	1.32
7	Lakeland Dr	Clover Bar Rd	0	6	9	15	31,200	1.32
8	Jim Common Dr	Sherwood Dr	0	5	3	8	17,100	1.28
9	Fir St	Sherwood Dr	0	8	9	17	37,400	1.25
10	Sherwood Dr	Brentwood Blvd	0	4	9	13	29,200	1.22
11	Baseline Rd	Clover Bar Rd	0	8	12	20	47,200	1.16
12	Wye Rd	Ordze Dr	0	1	15	16	41,400	1.06
13	Lakeland Dr	Sherwood Dr	1	4	9	14	36,600	1.05
14	Baseline Rd	Shivam Blvd	0	4	11	15	40,400	1.02
15	Baseline Rd	Baseline Village	0	4	8	12	35,000	0.94
16	Main Blvd	Sherwood Dr	1	7	5	13	38,200	0.93
17	Baseline Rd	17 St	0	8	6	14	43,300	0.89
18	Wye Rd	Brentwood Blvd	2	3	8	13	40,400	0.88
19	Granada Blvd	Sherwood Dr	1	5	4	10	31,400	0.87
20	Sherwood Dr	Broadmoor Blvd	0	5	4	9	29,250	0.84
21	Wye Rd	Ash St	1	5	4	10	33,300	0.82
22	Baseline Rd	Glenbrook Blvd	2	4	4	10	33,700	0.81
23	Pembina Rd	Broadmoor Blvd	0	2	7	9	32,350	0.76
24	Baseline Rd	Bethel Dr	0	1	9	10	41,200	0.66
25	Wye Rd	Sherwood Dr	0	2	9	11	50,300	0.6

Table 5: intersection rankings by collision rates (2018)

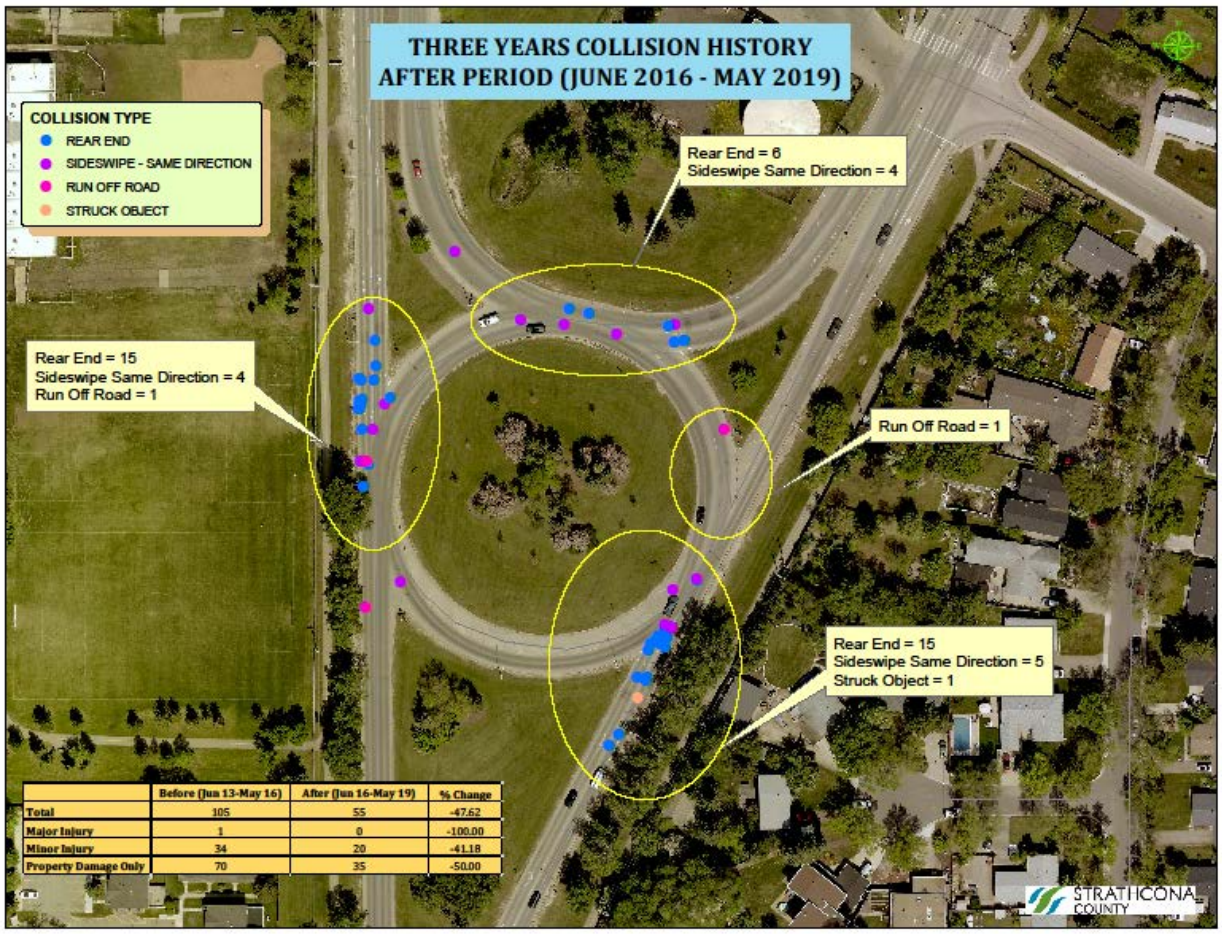


Figure 4: Collision location map 2016 – 2019

As shown in Figure 4, the collision location has changed from primarily inside of the traffic circle to outside to the traffic circle with a measurable reduction in the severity of the recorded collisions as well.

Video predictive modeling assessment study

Fireseeds North was retained to undertake a before and after safety evaluation of the above noted traffic circle using MicroTraffic technology using recorded video supplied by Strathcona County. The after data shows an overall improved operating environment. Of the eight metrics evaluated, six improved, one stayed the same, and one deteriorated slightly.

Background

The traffic circle has three entrances and exits. In the before condition, all entrances and exits were served by two lanes, the traffic circle provided two circulating lanes, and all movements were generally permitted from each lane. In the after condition, the key changes were:

- southern arc restricted to one lane using pavement markings and delineator posts
- northeast exit to Sherwood Drive restricted to one lane

- at SE entrance, the left entering lane is required to circulate while the right entering lane has the option to circulate or exit directly north on Sherwood Drive
- at NE entrance, the left entering lane is required to circulate while the right entering lane has the option to circulate or exit north on Broadmoor Boulevard
- at NW entrance, the right entering lane is required to exit directly to the South without circulating, while the left entering lane has the option to exit directly south or to circulate

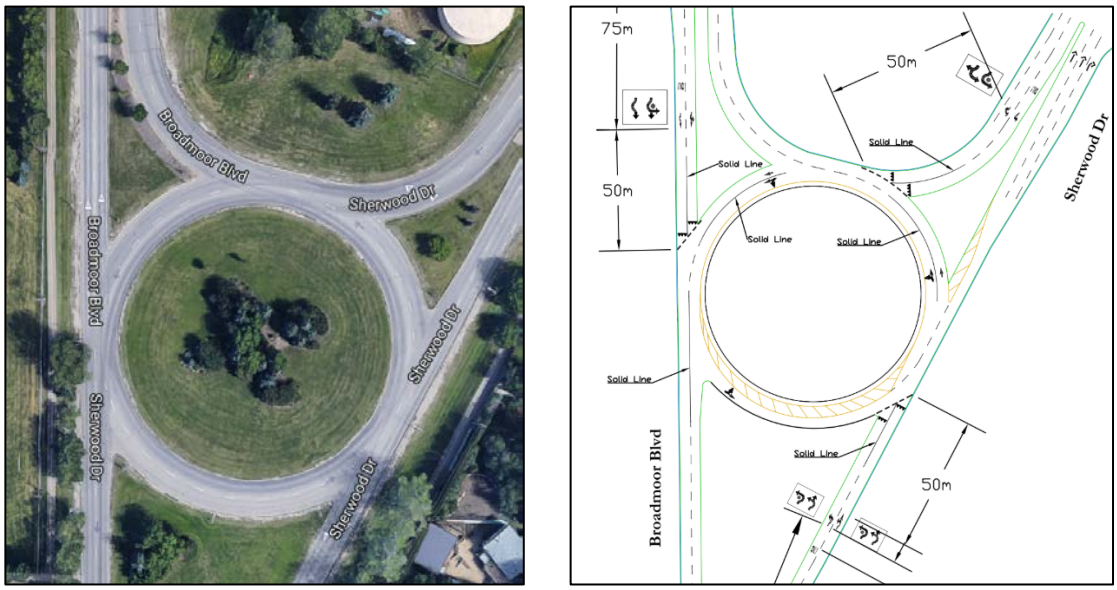


Figure 5: Traffic Circle Before (left) and After (right)

The County supplied 24 hours of before video from February 24, 2015, and 81 hours of after video from June 2019. The video was collected at the northwest and southeast entrances to measure entering conflicts as shown in the figure below. Video was also provided at the northeast entrance; however this video did not have a relevant conflict zone in view and could not be analyzed.

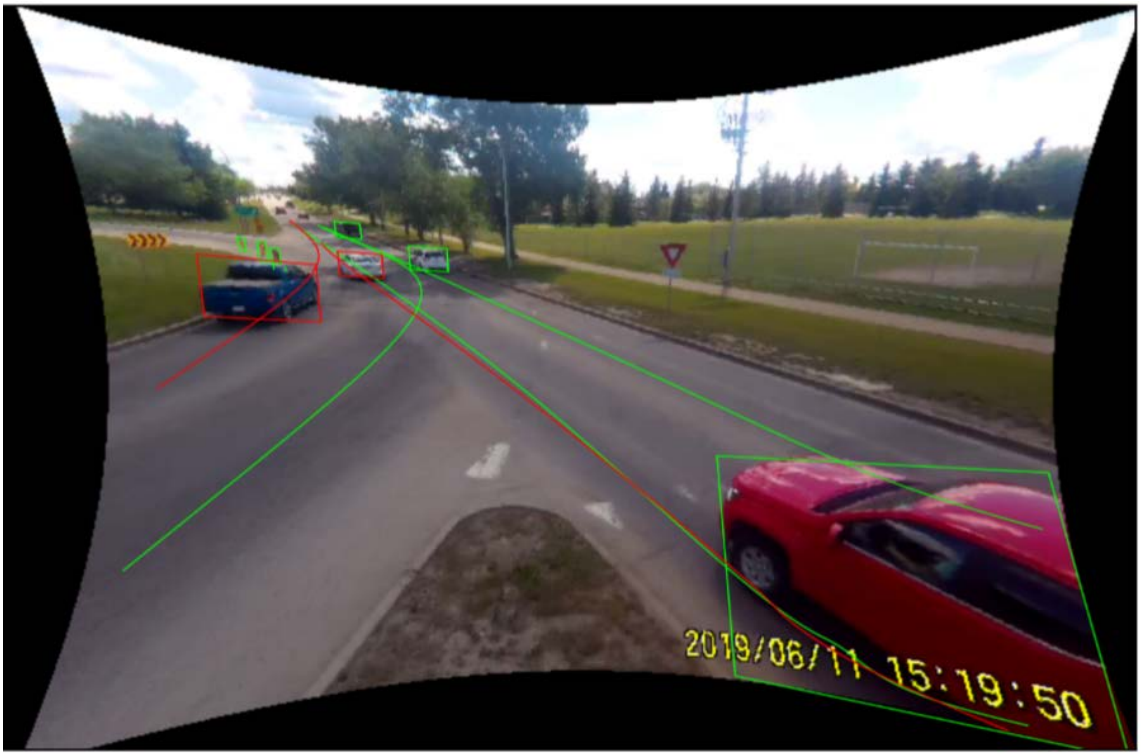


Figure 6: Conflict of type where entering vehicle does not yield to circulating vehicle

Methodology

The before and after conflict evaluation is based on the science of surrogate safety. Surrogate safety refers to proactively measuring safety by near-misses, conflicts, and other risk indicators instead of waiting to measure collisions. It offers the following benefits:

- Higher sample sizes allow more statistically robust inferences
- Faster measurement and evaluation cycles
- High resolution and detail in risk measurement

The surrogate safety approach has been validated in more than 300 academic papers in the last 5 years, including in research by the University of British Columbia, University of Alberta, University of Calgary, Concordia University, Ryerson, Purdue, and Lund University (Sweden).

Surrogate measures of safety were obtained using MicroTraffic diagnostic technology. MicroTraffic diagnostic technology uses AI-powered computer vision to identify, classify, and track road users, including their speeds and how close they are to one another in time and space. Surrogate measures of safety are then derived from these trajectories using a safe systems measurement technique that assesses the likelihood and severity of a collision that could materialize from any conflict.

In June 2019, MicroTraffic won the top paper award at the Canadian Association of Road Safety Professionals Conference for a study that demonstrated the predictive link between its 'Safe Systems Measurement Technique' and long-term collision outcomes.

For this study, MicroTraffic measured three surrogate indicators of safety

1. Speed-adjusted non-yielding entering PET
2. Parallel non-yielding events
3. Non-prepared weaving movements

The first indicator, *Speed-adjusted non-yielding entering PET,* measures cases when the entering vehicle proceeds in front of a circulating vehicle, and the circulating vehicle arrives at a conflict point previously occupied by the leading entering vehicle less than 2 seconds after the leading vehicle departs that point. In these cases, the entering vehicle is in violation of yield control and creates a risk situation that could require the circulating vehicle to brake.

The second indicator, *Parallel non-yielding* refers to cases where an entering and circulating vehicle arrive at the weaving section at the same time; their paths do not cross but they end up in a position parallel to one another. In these cases, the entering vehicle is also in violation of yield control and creates a potential risk situation if the circulating vehicle wanted to change lanes to the right for an exit.

The third indicator, *Non-prepared weaving movements,* refers to vehicles entering the intersection in a lane that does not align with their intended trajectory, requiring excessive lane changes and conflict potential in the weaving section. For example, entering in the left lane while ultimately exiting directly to the right without circulating.

Video predictive modeling assessment study results summary

The tables below provide an overall summary of conflict results, with additional graphs, tables, and time of day distributions in the results details section.

Table 6: Results Summary, Southeast Entrance

Indicator	Before	After
Speed-adjusted non-yielding entering PET	0.40% Medium Risk Interaction 0.00% High Risk Interaction	0.39% Medium Risk Interaction 0.00% High Risk Interaction
Parallel non-yielding	120 events per day	0 events per day
Non-prepared weaving movements	8.69% direct exit right after left lane entrance	0.34% direct exit right after left lane entrance

Table 7: Results Summary, Northwest Entrance

Indicator	Before	After
Speed-adjusted non-yielding entering PET	0.75% Medium Risk Interaction 0.02% High Risk Interaction	1.02% Medium Risk Interaction 0.00% High Risk Interaction
Parallel non-yielding	69 events per day	**47 events per day**
Non-prepared weaving movements	0.16% circulate left after right lane entrance	0.13% circulate left after right lane entrance

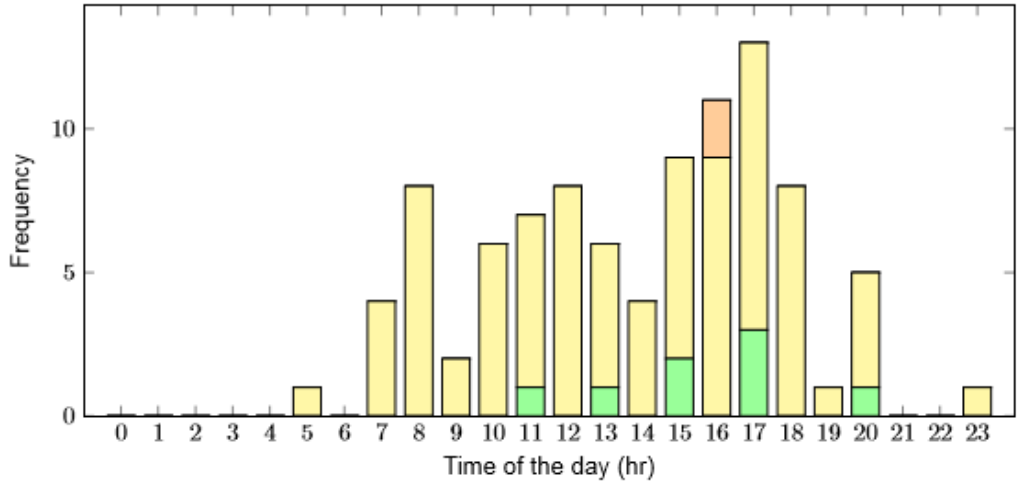
A total of eight measures were compared (three indicators at two sites, with one indicator reported at two risk levels). It is noted that of the eight measures that were compared, six decreased, one increased, and one stayed the same. This reflects an overall improvement of safety in the after period.

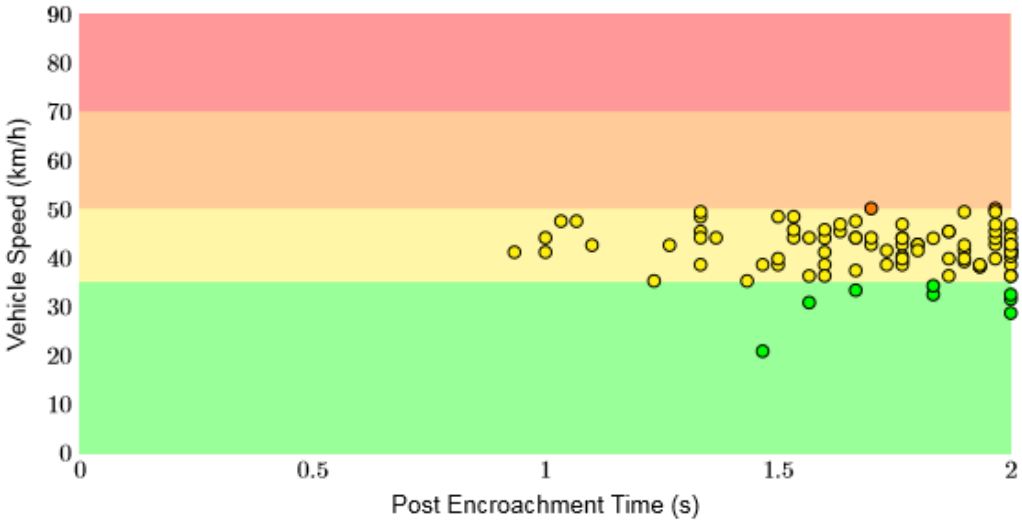
Detailed Results

Detail 1: Southbound Vehicle Entering at Northwest Approach vs Vehicle Circulating in Roundabout @ Sherwood Dr and Broadmoor Blvd - Strathcona County - AB - February 24 2015 @ 00:00 - February 24 2015 @ 24:00 (24 hours)

BEFORE Period

Risk Level	Critical Risk	High Risk	Medium Risk	Low Risk
Measured Frequency	0	2	84	8
Annual Estimate	0	730	30660	2920
Conflict Rate (%)	0	0.02	0.75	0.07
Relative Risk	NA	NA	NA	NA

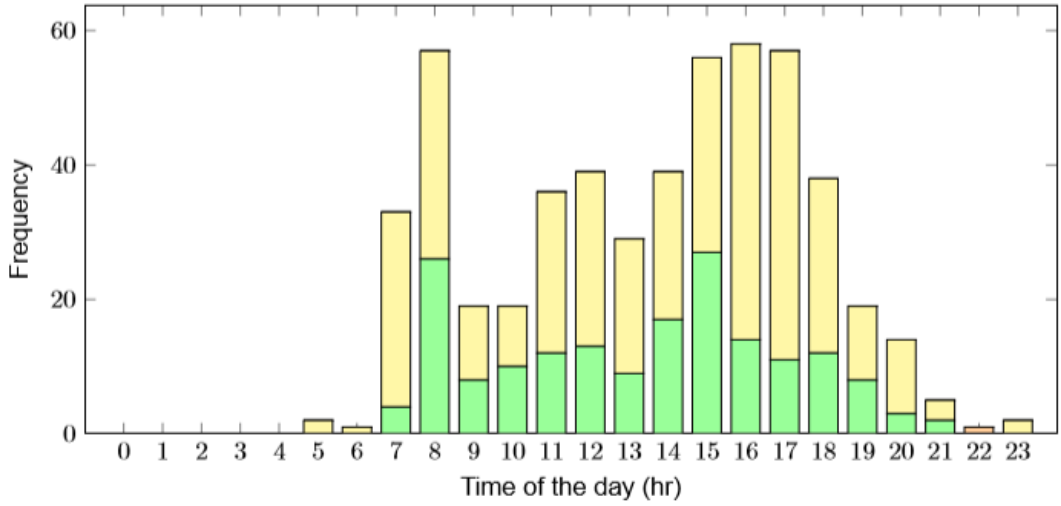


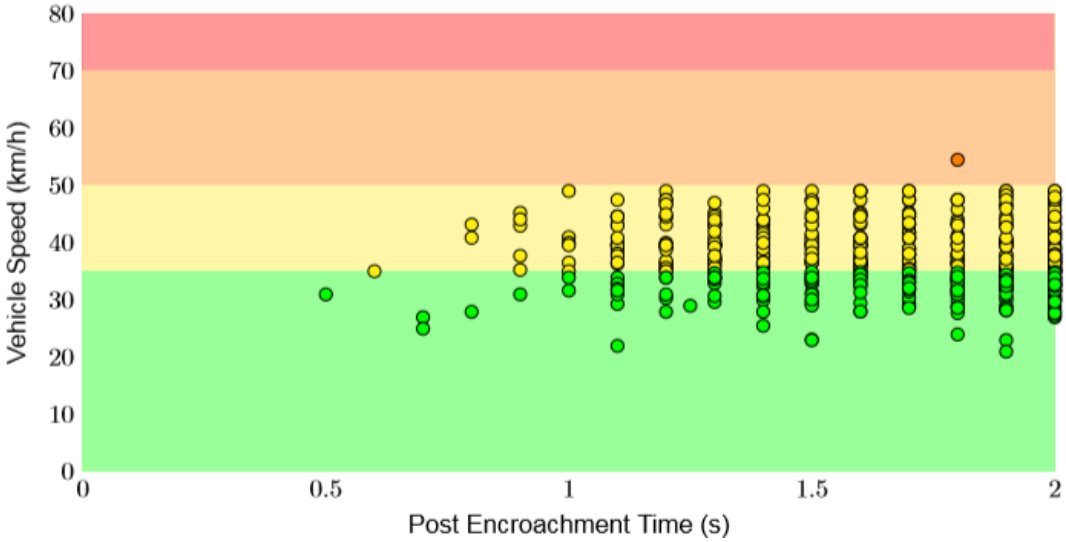


Detail 1: Southtbound vehicle entering roundabout vs Westbound vehicle in roundabout (NW) @ Sherwood Dr and Broadmoor Blvd - Strathcona County - AB - June 11 2019 @ 00:00 - June 14 2019 @ 09:00 (81 hours)

AFTER Period

Risk Level	Critical Risk	High Risk	Medium Risk	Low Risk
Measured Frequency	0	1	347	176
Annual Estimate	0	122	42218	21413
Conflict Rate (%)	0	0	1.02	0.52
Relative Risk	NA	NA	NA	NA

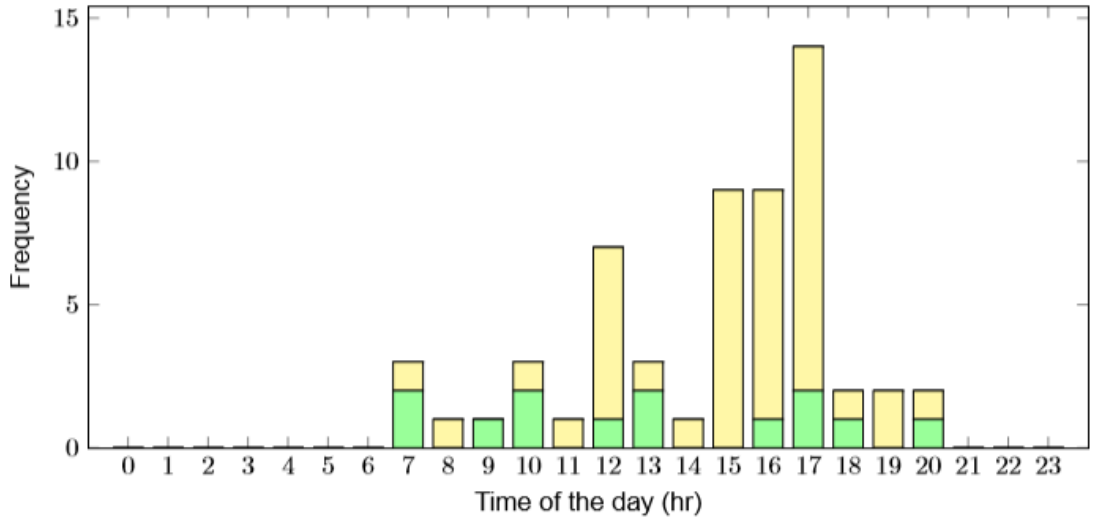


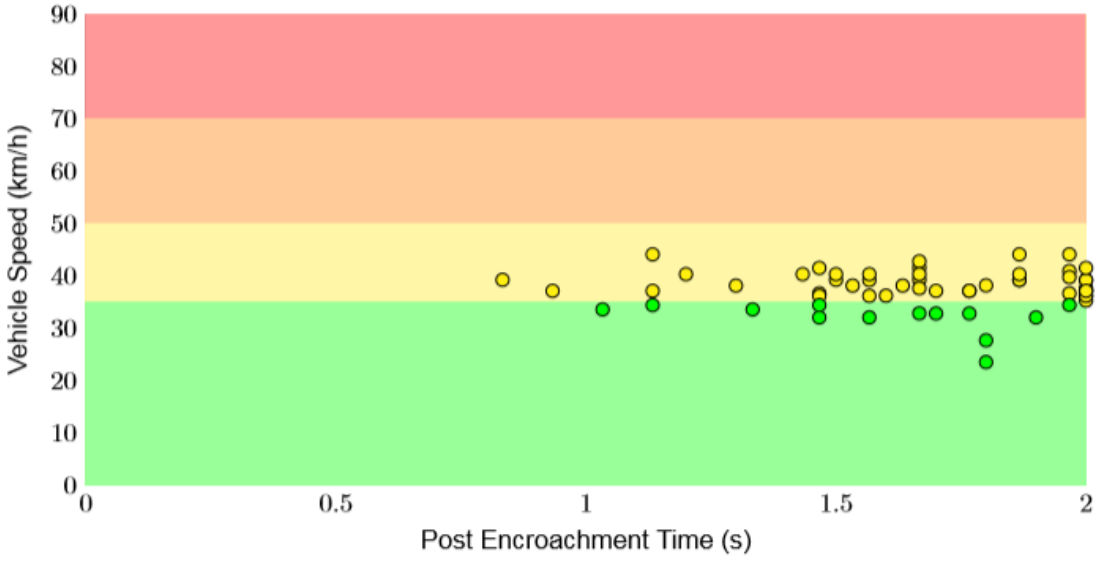


Detail 2: Northbound Vehicle Entering at Southeast Approach vs Vehicle Circulating in Roundabout @ Sherwood Dr and Broadmoor Blvd - Strathcona County - AB - February 24 2015 @ 00:00 - February 24 2015 @ 24:00 (24 hours)

BEFORE Period

Risk Level	Critical Risk	High Risk	Medium Risk	Low Risk
Measured Frequency	0	0	45	13
Annual Estimate	0	0	16425	4745
Conflict Rate (%)	0	0	0.4	0.11
Relative Risk	NA	NA	NA	NA

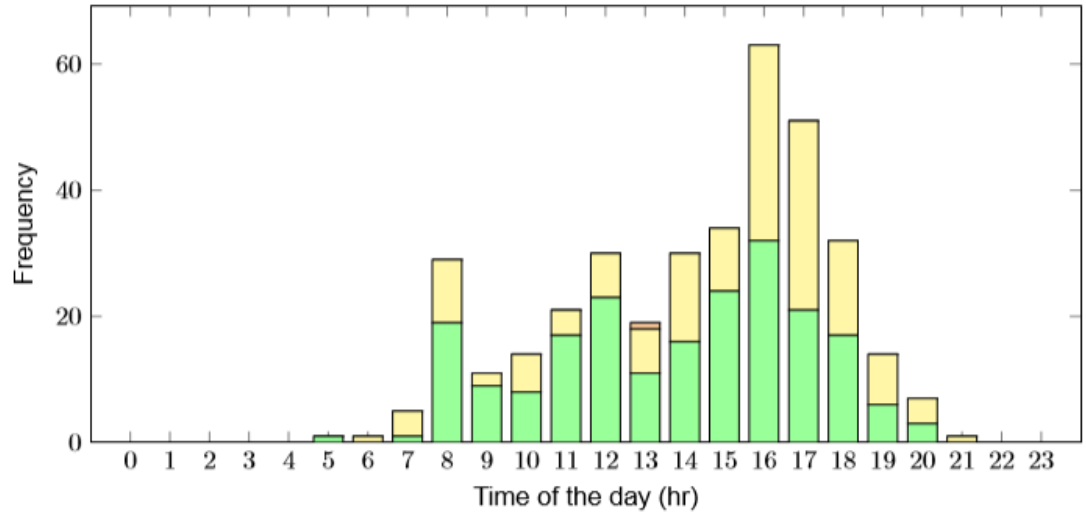


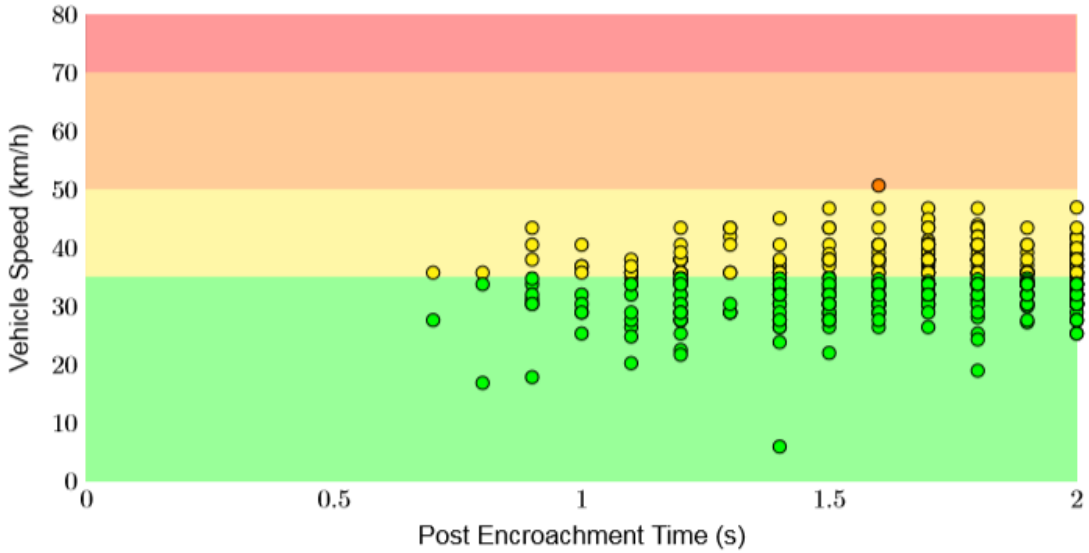


Detail 2: Northtbound vehicle entering roundabout vs Eastbound vehicle in roundabout (SE) @ Sherwood Dr and Broadmoor Blvd - Strathcona County - AB - June 11 2019 @ 00:00 - June 14 2019 @ 09:00 (81 hours)

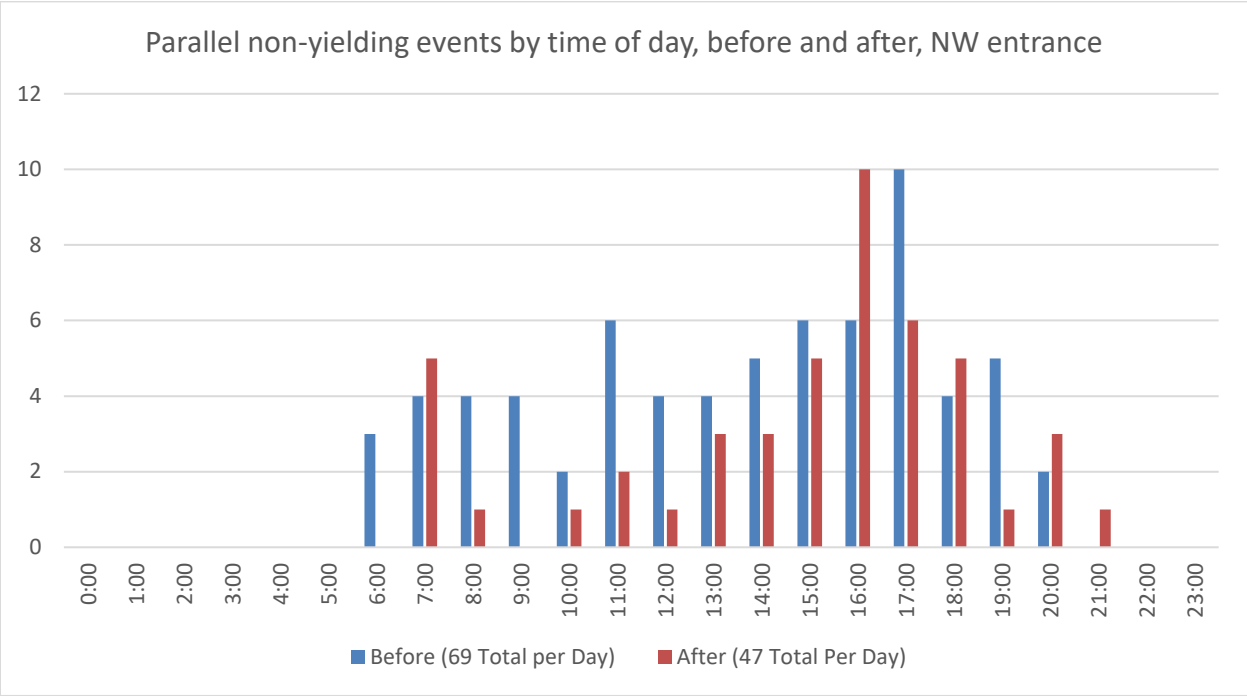
AFTER Period

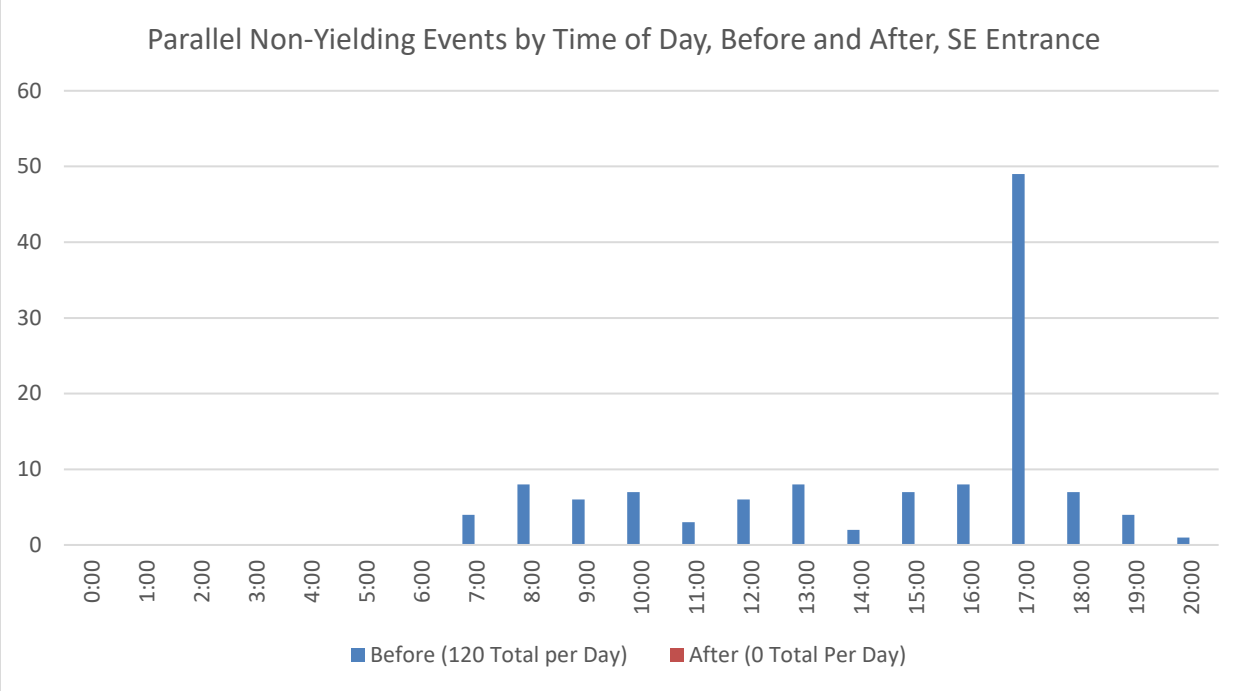
Risk Level	Critical Risk	High Risk	Medium Risk	Low Risk
Measured Frequency	0	1	154	208
Annual Estimate	0	122	18737	25307
Conflict Rate (%)	0	0	0.39	0.53
Relative Risk	NA	NA	NA	NA



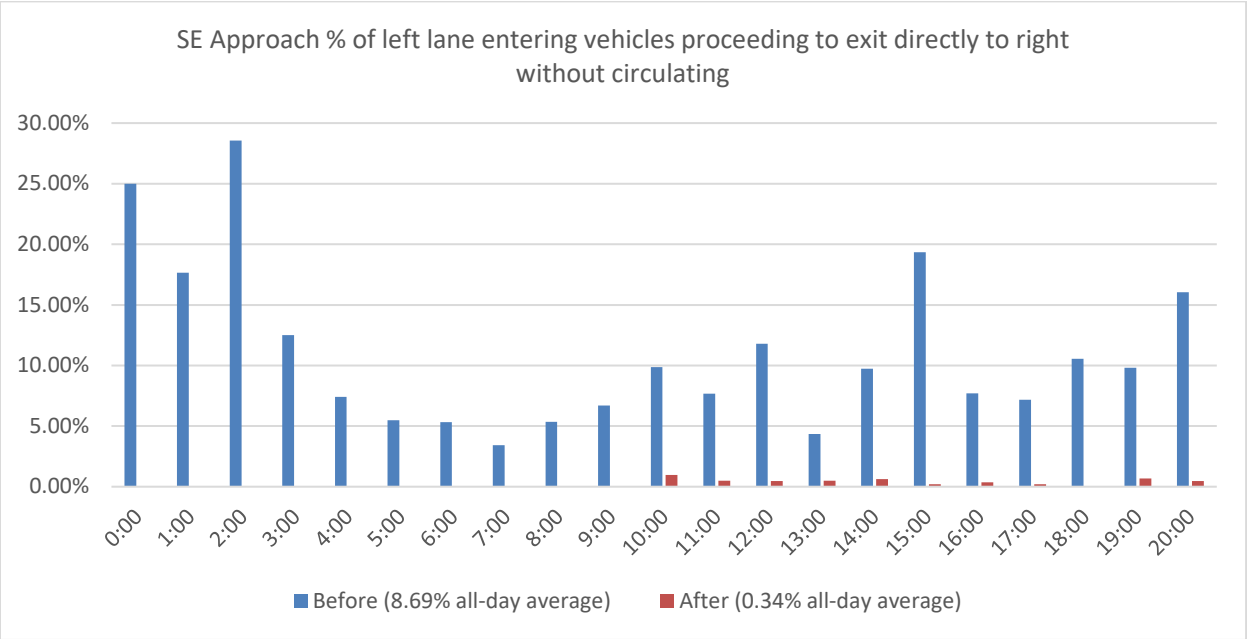


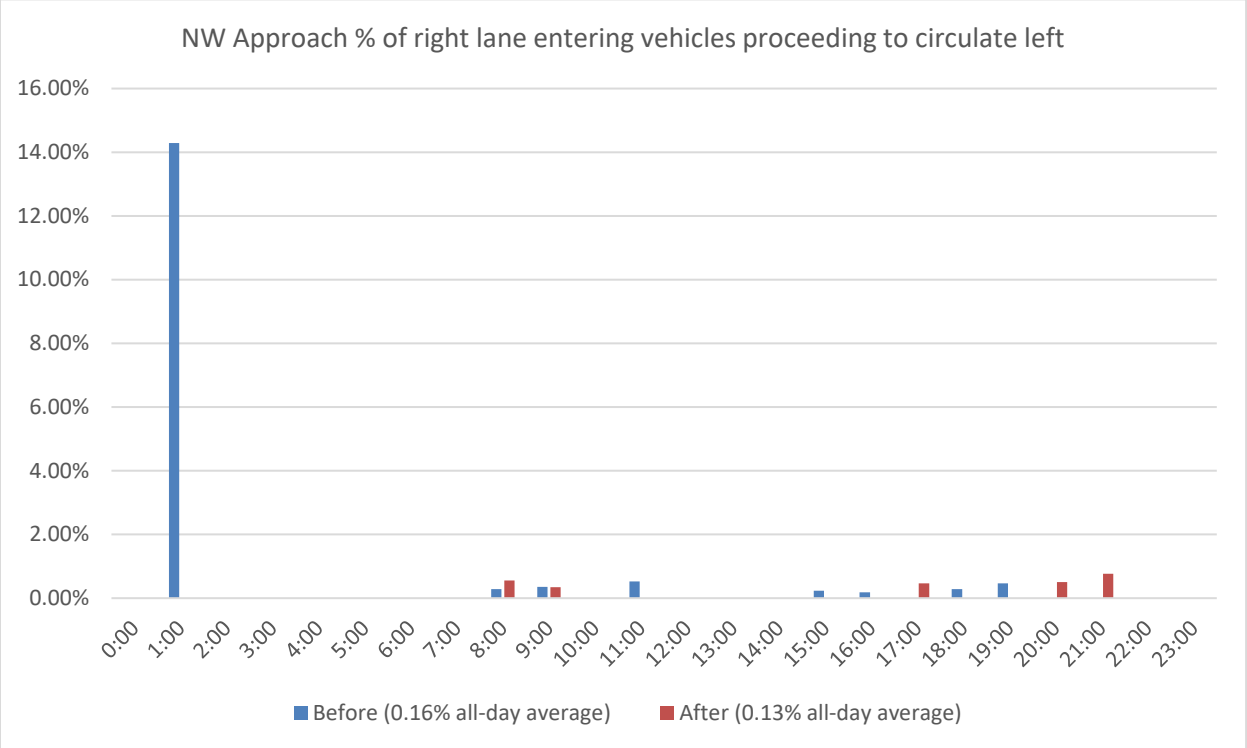
Parallel Non-Yielding Events





Non-Prepared Weaving Movements





Video predictive modeling assessment study conclusions

Of the eight-safety metrics recorded, six improved (some dramatically), one stayed the same, and one got worse (by about 33%).

Overall, the operational and geometric improvements at the intersection have reduced conflict potential and improved safety from a surrogate perspective.

The slight increase of risk on one of the eight indicators is likely attributable to the fact that the south arc traffic is concentrated in one lane, providing lower average headways in which entering vehicles attempt to find gaps. As a result, entering vehicles are more aggressive in inserting themselves in front of circulating vehicles instead of yielding.

Importantly, no critical risk events were detected in the before or after period, and an extremely low frequency of high-risk events were detected. The majority of the interaction data analyzed in this report for both before and after periods represents risks at the medium and lower severity levels.

In our view, the data shows that the interim measures provide a significant safety improvement for the current time. The intersection should be re-assessed for total reconstruction or conversion to a modern roundabout style if it fails under capacity or if a new conflict analysis under increased volumes shows a sharp rise in conflicts.

Public complaints and perception

Public complaints for traffic operations at the traffic circle have varied since the alterations and include issues of poor driver behaviour, unfamiliarity with the traffic control, positive comments about the modifications, and a general dislike for the modifications. Public feedback captured through the County Connect System over the past three years is summarized in Table 8 below.

No.	Feedback	Number
1	Positive feedback	6
2	Negative feedback	66
	Total	**72**

Table 8: Public feedback through County Connect – May 2016 to May 2019

Most complaints were focused on the modifications at the traffic circle and were received during the initial opening and implementation of the interim modifications while drivers became familiar with the changes.

Conclusions

The Sherwood Drive and Broadmoor Boulevard traffic circle has been reviewed for past three years to assess and analyze the modified traffic operations and ongoing safety of the intersection in order to maintain safe traffic operations.

Prior to the changes, the number of reported collisions was outside of acceptable levels and Strathcona County had a duty of care to improve operating conditions and safety for all road users. Based upon the observed operation, collision review, and a predictive video modeling study, the number of collisions has been reduced 48% overall and 76% for 2018 as a result of the interim safety improvements changes completed in May 2016. This reduction in collisions has made the traffic circle one of the lowest arterial road intersections for collisions and is now operating better than expected when compared to similar traffic circles throughout the capital region.

Upon review of the safety evaluation and consideration of potential options “the Traffic Safety Advisory Committee recommends to Council the traffic circle be considered for redesign and reconstruction upon regular rehabilitation of the road as deemed necessary by Strathcona County with a proper review cost/benefit analysis”. Current asset management reports are indicating that the pavement structure and quality will require replacement within 6 to 10 years.

Recommendations

The interim traffic safety alterations and improvements to the Sherwood Drive and Broadmoor Boulevard traffic circle has proven to reduce collisions and improve safety. At this time, no additional changes or improvements to the Sherwood Drive and Broadmoor Boulevard traffic circle are recommended. Operation and maintenance of the traffic circle can be maintained until traffic circle operations no longer support the volume of traffic or when the roads require scheduled rehabilitation due to lifecycle replacement in 6 to 10 years as defined through asset management.