



APPENDIX G

SITE RANKING AND SAFETY REVIEW



SITE RANKING AND SAFETY REVIEW

1.0 GENERAL

Strathcona County maintains spreadsheets of intersection collisions as well as ranking by grid road to grid road intersections and grid road to County residential subdivision intersections. To select a number of representative sites, a review of the current data and ranking system was completed.

2.0 SAFETY INFORMATION PROVIDED BY STRATHCONA COUNTY

Intersection Collision Information - 248 intersections, 2001 - 2008 collision counts, all rural

Maps - all collisions, fatal and serious collisions, and animal collisions in the County

Rural Road Safety Upgrades - ranking top 10 grid/grid and top 10 grid/CRS intersections. Rankings not based on collision counts or rates. Traffic control, widths, traffic volumes and sight impairments for select grid/grid intersections.

CRS\Grid Road Intersection Safety Assessment (Report) - Risk (liability) ranking for Grid/CRS intersections based on sight distances (horizontal and vertical) and traffic volumes. Collisions are listed but not included in ranking system. Spreadsheet with ranked intersections also supplied.

The current ranking system is based on the physical characteristics of the sites and the objective safety these features provide. Collisions are recorded by intersection, and are reported in the ranking, but are not used in the determination of rank for improvements. The subjective safety, as represented by the resultant collisions, should be included in the selection of sites for improvement as the larger number of collisions at these sites will allow for the identification of underlying collision causes, and the opportunity to reduce the number of collisions on the network. An intersection that is objectively safe (i.e. satisfies guidelines) but has a large number of collisions (i.e. poor subjective safety) should be evaluated before an intersection that does not satisfy guidelines but has very few collisions; despite being below the County guidelines there is little safety benefit to improving intersections where no clear collision history exists. The effectiveness of reducing collisions is greater where a higher concentration of collisions exists.

To address both of these approaches a blended approach was taken. The spreadsheet of intersection collisions was ranked by the number of collisions at a site; intersections with highways maintained by Alberta Transportation (AT) were excluded from this analysis, but could be included for purposes of identifying intersections for AT to review. The top twenty intersections, by number of collisions, were selected and traffic information was obtained from the most recent Rural Traffic Counts on the County website. The intersections were then ranked by collision rate per 1,000,000 entering vehicles. The ranking is as follows:



TABLE 1: INTERSECTION COLLISION RATE RANKINGS

Rank	Intersection Name	Total Collisions (2001-2008)	Traffic Volume (weekday vehicles entering)	Approx. entering vehicles 2001 - 2008 (1,000,000's)	Collisions per 1,000,000 entering
1	Twp Rd 520 & Rge Rd 231	7	1198	3.50	2.002
2	Twp Rd 520 & Rge Rd 224	7	1365	3.98	1.757
3	Twp Rd 522 & Rge Rd 222	5	1033	3.02	1.658
4	Twp Rd 520 & Rge Rd 223	5	1088	3.18	1.574
5	Twp Rd 530 & Rge Rd 215	5	1143	3.34	1.498
6	Twp Rd 520 & Rge Rd 220	5	1203	3.51	1.423
7	Twp Rd 530 & Rge Rd.222	16	4660	13.61	1.176
8	Twp Rd 524 & Rge Rd 214	5	1634	4.77	1.048
9	Rge Rd 224 & Twp Rd 542	4	1373	4.01	0.998
10	Twp Rd 514 & Rge Rd 232	6	2267	6.62	0.907
11	Rge Rd 214 & Rge Rd 560	8	3097	9.04	0.885
12	Twp Rd 524 & Rge Rd 213	4	1553	4.53	0.882
13	Twp Rd 520 & Rge Rd 233	4	1633	4.77	0.839
14	Twp Rd 515 & Rge Rd 233	5	2138	6.24	0.801
15	Twp Rd 524 & Rge Rd 222	18	8065	23.55	0.764
16	Rge Rd 231 & Twp Rd 514	4	1934	5.65	0.708
17	Rge Rd 214/215 & Twp Rd 550	4	1977	5.77	0.693
18	Twp Rd 522 & Rge Rd 225	4	2039	5.95	0.672
19	Twp Rd 530 & Rge Rd 225	6	3908	11.41	0.526
20	Rge Rd 215 & Twp Rd 524	7	5741	16.76	0.418

For comparison purposes, Alberta Transportation produced Collision Data Analysis Reports (2000 - 2004) reports collision rates on provincial intersections are up to 2.81 collisions per million vehicles entering with an average value of special monitoring locations of 0.47 collisions per million vehicles entering. For example, the intersection of Highway 21 and Highway 630 (Wye Road) had a collision rate of 2.55 collisions per million vehicles entering between 2000 and 2004. This indicates that the top twenty intersections in Strathcona County by collision frequency are performing similarly to provincial intersections in terms of collision rates.

Of the top twenty intersections identified by this method seven are found on the top twelve list prepared by the County. These seven intersections are good candidates for detailed desktop evaluation as they are consistently identified as having objective and subjective safety issues.

None of the intersections of grid roads and Country Residential Subdivision (CRS) roads identified in the ranked list of safety risk sites are reported to have a collision record in the intersection collision spreadsheet. The ranking in the Rural Safety Upgrades spreadsheet provides the top ten Grid Road/CRS intersections and this list is completely different from

the list provided in the grid road/CRS intersection safety assessment document. The CRS intersections have been identified as safety concerns in terms of objective safety in a very sound manner and this should be used to supplement collision data.

Reducing risk and reducing collisions are two different tasks. With the purpose of improving safety in mind, the ranking of sites should concentrate on sites identified on the basis of collisions. Improving the objective safety of the road network at sites with little to no collision history should be a secondary consideration in terms of reducing collisions.

Based on the two ranking methods the following ten sites have been selected for detailed desktop review:

TABLE 2: DETAILED DESKTOP REVIEW SITES				
Intersection	County Rank	EBA Rank	Collisions (2001-2008)	Intersection Type, Setting, Entering Volume (vehicles / week day)
Twp Rd 520 & Rge Rd 231	8	1	7	4 leg, rural / urban transition, 1,189
Twp Rd 520 & Rge Rd 224	11	2	7	4 leg, rural, 1,365
Twp Rd 520 & Rge Rd 223	9	4	5	4 leg, rural, 1,088
Twp Rd 524 & Rge Rd 214	2	8	5	4 leg, rural, 1,634
Twp Rd 514 & Rge Rd 232	1	10	6	4 leg, rural, 2,267
Twp Rd 560 & Rge Rd 214	12	11	8	3 leg, industrial, 3,097
Twp Rd 530 & Rge Rd 222	N/A	7	16	4 leg, country residential, 4,660
Twp Rd 510 & Hoppe Drive	1 (CRS)	N/A	N/A	Risk number 82, low traffic (189)
Rge Rd 220 & Royal Estates	3 (CRS)	N/A	N/A	Risk number 51, high traffic (1,234)
Rge Rd 225 & Lakeview Estates	6 (CRS)	N/A	N/A	Risk number 41, mid traffic (589)

This selection of sites includes sites identified by both selection methodologies for a variety of settings, traffic volumes and collision histories. The inclusion of CRS intersections will allow detailed desktop analysis of this type of intersection which has been identified to have safety concerns but for which no collision history is available. The detailed desktop of these selected sites will allow for the identification of localized engineering improvements and related costs.

3.0 COLLISION ANALYSIS OF SELECTED LOCATIONS

Based on more detailed data, from the Strathcona County COTRIS Reports, the collisions from 2004 to 2008 inclusive were analyzed for frequency, rate and trends in collision type or direction. Using this analysis, symptoms of safety problems can be observed, the problems identified, and measures to mitigate these problems can be determined. It is important to note that the collision rates are different from those presented previously because of the different analysis periods.



3.1 TWP RD 520 & RGE RD 231

From 2004 to 2008 there were two collisions at this location, one mid week collision in the afternoon, and one weekend collision at night. The collision rate at this intersection for this time period was 0.92 collisions per million vehicles entering the intersection. The weekday collision was a right angle collision involving an eastbound vehicle and the weekend collision was a right angle collision involving a westbound vehicle.

Safety issues and recommendations:

The horizontal sight distance was listed in the intersection characteristics provided by the County as being impaired in the southeast quadrant of this intersection and this may have been a factor in the collision involving an eastbound vehicle. Enhancements to the STOP control (such as a centre line, a stop bar, and Stop Ahead signs) on the east and west legs could be considered to increase awareness of the need to stop, and advance street name signs could be considered to alert drivers on Range Road 231 of the intersection.

3.2 TWP RD 520 & RGE RD 224

From 2004 to 2008 there were two mid week collisions at this location, one in the afternoon and the other in the evening. The collision rate at this intersection for this time period was 0.80 collisions per million vehicles entering the intersection. Both collisions were run off road left collisions involving northbound vehicles.

Safety issues and recommendations:

The south leg of this intersection is a 6.8m surface Class II road with horizontal and vertical sight impairments of the intersection, according to the intersection characteristics provided by the County. Delineation of the roadway to guide the driver could be considered approaching the intersection, such as a center line or roadside flexible delineators. Stop control enhancements such as Stop Ahead signs, stop bars and centre lines may also assist drivers in maintaining proper lane location.

3.3 TWP RD 520 & RGE RD 223

From 2004 to 2008 there were four mid week collisions at this location, one in the am peak and three in the pm peak. The collision rate at this intersection for this time period was 2.01 collisions per million vehicles entering the intersection. All of the collisions were right angle collisions, three involving southbound vehicles and one involving a westbound vehicle. There is a trend of right angle collisions in peak hours at this intersection.

Safety issues and recommendations:

This intersection is a skewed intersection on a curve of Township Road 520. The trend of right angle collisions may be due to a combination of drivers not recognizing the need to stop, proceeding when it is unsafe to do so and vehicles on the uncontrolled legs not noticing the intersection. Use of STOP control enhancements such as Stop Ahead signs, centre lines and stop bars for the controlled legs and advance street name signs for the



uncontrolled legs will alert drivers that they are approaching an intersection. A horizontal sight distance restriction was also noted by the county in the northwest quadrant which could be addressed as a part of the regular maintenance program. Curve warning signs are noted by the County to be in poor condition and could also be replaced as a part of regular maintenance activities. The location of the intersection on the curve may be resulting in high driver workload and a longer term solution for this intersection realignment could be considered in conjunction with other road upgrades if they are being considered.

3.4 TWP RD 524 & RGE RD 214

From 2004 to 2008 there were four mid week collisions at this location. The collision rate at this intersection for this time period was 1.34 collisions per million vehicles entering the intersection. Three of the collisions were right angle collisions and the fourth collision was a run off road left collision. The run off road left collision was a northbound vehicle in the afternoon and the right angle collisions were in the pm peak and late night, involving northbound and southbound vehicles.

Safety issues and recommendations:

The north and south legs of this intersection are STOP controlled and enhancements are recommended to reduce right angle collisions. Enhancements such as Stop Ahead signs, centre lines and stop bars will help drivers identify the need to stop and where to stop; a well maintained centerline may also help to delineate the road and prevent run off road left collisions (the other collision type noted at this intersection). To alert drivers on the uncontrolled road of the intersection, advance street name signs could also be considered. Horizontal sight distance impairment was noted by the County in the northwest and southeast quadrants of the intersection; this could be improved by clearing along the roadway or clearing corner cuts to improve sight lines.

3.5 TWP RD 514 & RGE RD 232

From 2004 to 2008 there were three mid week collisions and one weekend collision at this location. The collision rate at this intersection for this time period was 0.97 collisions per million vehicles entering the intersection. All of the collisions were right angle collisions involving northbound and southbound vehicles. The collisions occurred during off peak times or during the late night. There is a trend of right angle collisions at this intersection.

Safety issues and recommendations:

These collisions involve vehicles on the north and south legs of the intersection. These legs of the intersection are STOP controlled. Enhancements to the STOP control such as Stop Ahead signs, centre lines and stop bars may assist drivers in identifying the need to stop. Sight distance in the southeast quadrant of the intersection was noted by the County to be impaired and improvement of the sightlines can allow drivers to better judge the speed and distance of approaching vehicles. Advance notification of the intersection in the form of advance street name signs could also be considered.



3.6 TWP RD 560 & RGE RD 214

From 2004 to 2008 there were five mid week collisions and one weekend collision at this location. The collision rate at this intersection for this time period was 1.06 collisions per million vehicles entering the intersection. Three of the collisions were right angle collisions involving southbound and westbound vehicles during off peak periods and the evening, one southbound rear end collision at night, and one southbound struck object collision during the late night.

Safety issues and recommendations:

These collisions involve vehicles on the east leg of the intersection that is STOP controlled. Enhancements to the STOP control such as Stop Ahead signs, centre lines and stop bars may assist drivers in identifying the need to stop. Advance notification of the intersection in the form of advance street name signs could also be considered. Illumination may also be considered at this location if it meets the warrant for illumination based on traffic volumes and the fact that three of the six collisions occurring in the night or late night periods.

3.7 TWP RD 530 & RGE RD 222

From 2004 to 2008 there were six mid week collisions and seven weekend collisions at this location. The collision rate at this intersection for this time period was 1.52 collisions per million vehicles entering the intersection. Eight of the collisions were right angle collisions, two off road right collisions for northbound vehicles, one northbound left turn across path, one eastbound rear end and one sideswipe opposite direction collision. Six of the collisions occurred during daytime off peak periods, six during evening or late night periods and one in the am peak. Five of the right angle collisions involved eastbound vehicles and the other three involved westbound vehicles. There is a trend of right angle collisions at this intersection.

Safety issues and recommendations:


These collisions involve vehicles on the east and west legs of the intersection which are STOP controlled. Enhancements to the STOP control such as Stop Ahead signs, centre lines and stop bars may assist drivers in identifying the need to stop. Advance notification of the intersection in the form of advance street name signs could also be considered. The traffic volumes at this intersection may warrant improvements to the illumination and geometry of the intersection. Providing turn lanes may improve sight lines, allow turning vehicles to exit the through traffic lane and provide greater gaps in the approaching traffic.

3.8 TWP RD 510 & HOPPE DRIVE (RGE RD 203A)

No Collisions were reported at this location in the years 2004 to 2008.

Safety issues and recommendations:

This intersection was ranked first according to the risk number in the Country Residential/Grid Road Intersection Safety Assessment. Despite deficiencies in sight distance



this intersection is performing well with no collisions from 2004 to 2008. To improve the sight distance constraints at this site it is recommended that any improvements that can be made as a part of maintenance activities (e.g. clearing) be made but since no collisions have occurred, improvements to the vertical curve west of the intersection may not be of the highest priority. There could also be an opportunity to improve sight distances in conjunction with roadwork in the future.

3.9 RGE RD 220 & ROYAL ESTATES

No Collisions were reported at this location in the years 2004 to 2008.

Safety issues and recommendations:

This intersection was ranked according to the risk number in the Country Residential/Grid Road Intersection Safety Assessment. Despite deficiencies in sight distance and a high rating for traffic volume this intersection is performing well with no collisions from 2004 to 2008. Sight distance constraints could still be improved through regular maintenance activities such as clearing and cutting.

3.10 RGE RD 225 & LAKEVIEW ESTATES

No Collisions were reported at this location in the years 2004 to 2008.

Safety issues and recommendations:

This intersection was ranked according to the risk number in the Country Residential/Grid Road Intersection Safety Assessment. Despite deficiencies in sight distance this intersection is performing well with no collisions from 2004 to 2008. As with the intersection above, sight distance constraints could still be improved through regular maintenance activities such as clearing and cutting.

4.0 ROADWAY WIDTH AND ROAD SAFETY IN STRATHCONA COUNTY

4.1 OBSERVATIONS OF COLLISION FREQUENCY & ROAD WIDTH ON SELECTED CORRIDORS

The width of existing roads in Strathcona County has been identified as an area of concern. To explore whether road width is contributing to a safety problem, a number of road links were selected which exhibited higher collision frequencies than other county roads from 2003 to 2007. The road links which were identified as having the highest collision frequencies were then compared to the road width, as listed in the 2007 year in COTRIS, and the design class of the road. None of the roads identified were in the narrowest ranges observed, and many of the roads meet or exceed the road width in the applicable design classification. One would expect that the roads identified as having the highest collision frequencies would also be among the narrowest roads; this is not the case. It is important to note, however, that although the width of the roads is not currently an urgent safety issue it may be in the future and it is advisable to take proactive steps to maintain or improve road width.

4.2 LANE AND SHOULDER WIDTH FOR A FIXED ROAD WIDTH TO IMPROVE SAFETY

Maintaining and preserving existing roads through a program of pavement overlays is a method of extending the service life of existing infrastructure. However, this practice results in narrowing of the roadway and if this narrowing is not mitigated, by either planning for the narrowing by building wider pavement structures, by milling to maintain width or other approaches, there is concern that this may result in a reduction in safety performance.

How to best take advantage of existing pavement width is an issue for many municipalities and recent research has focused on this topic. The US Department of Transportation, Federal Highway Administration recently published a report (FHWA-HRT-09-031, Safety Evaluation of Lane and Shoulder Width Combinations on Rural, Two-Lane, Undivided Roads, 2009) which summarizes observed safety effects of various configurations of lane and shoulder width for a fixed pavement width.

For pavement widths of 7.92m to 9.75m the optimal lane width was found to be 3.66m, while on 10.36m pavement structures lane widths of 3.35m were found to provide the optimal safety benefit. For wider pavement structures the 3.66m and 3.35m configurations perform similarly.

For narrow lanes (<7.32m) with traffic volumes less than 1,000 AADT it was found that configurations with shoulders were safer than two lanes with no shoulders; a 2.74m lane with 0.91m shoulder performed best, followed by 3.35m lanes with 0.30m shoulders. However, for narrow lanes with higher traffic volumes (>1,000 AADT) it was found that the configuration with no shoulders was safest and reducing lane widths negatively impacted the safety performance.

4.3 SAFETY PERFORMANCE OF ROAD LINKS IN STRATHCONA COUNTY

The safety performance of road network links in Strathcona County compared to provincial highway links is as follows:

Road Description	Mean Collision rate per 100MVkm
Provincial Average, 2 lane undivided Highway, >1,000 AADT (2000-2004)	96.60 (53.6 animal, 43.05 non animal)
Provincial Average, 2 lane undivided Highway, <1,000 AADT (2000-2004)	136.73 (85.5 animal, 51.23 non animal)
Twp Rd 514; Rge Rd 232 to 234 (AADT 1,400) (2003-2007, 10 collisions)	122.3
Rge Rd 215; Twp Rd 522 to 524 (AADT 750) (2003-2007, 5 collisions)	114.1
Twp Rd 522; Rge Rd 224 to Hwy 21 (AADT 1,500) (2003-2007, 12 collisions)	136.9

These collision rates indicate that roads in the County are performing similarly to provincial highways for two lane undivided highways.