



City of
Peterborough

To: **Members of the Committee of the Whole**

From: **W.H. Jackson, Director of Utility Services**

Meeting Date: **April 18, 2017**

Subject: **Report USTR17-008**
River Road South / Bensfort Road Traffic Operational Review

Purpose

A report to present the findings and recommendations from the River Road South / Bensfort Road Traffic Operational Review.

Recommendations

That Council approve the recommendations outlined in Report USTR17-008 dated April 18, 2017, of the Director of Utility Services, as follows:

- a) That a 2017 Capital Budget be created in the amount of \$185,000 for the Design and Construction of Improvements to the Intersection of River Road South and Bensfort Road as shown in Appendix B to Report USTR17-008; and funded from the uncommitted balance in the 2017 Capital Budget for Traffic Improvements (project Reference 5-13-04); and
- b) That the construction of the improvements to the intersection of River Road South and Bensfort Road be completed as soon as possible in 2018.

Budget and Financial Implications

The implementation of the oversized curve warning signs and speed advisory tabs on River Road South and Bensfort Road will cost approximately \$500.

The estimated cost to implement the recommended curb, sidewalk and road delineation improvements is \$185,000, including \$35,000 for engineering design, contract administration, inspection and a \$25,000 contingency. Funds for all of the proposed works are available in the uncommitted balance in the 2017 Capital Budget for Traffic Improvements (Project Reference 5-13.04).

Background

In November 2016, City staff undertook a traffic operational review at the intersection of the River Road South and Bensfort Road in response to resident's concerns with respect to vehicle speed, vehicle collisions and the need for improvements to better protect pedestrians.

Site Details

River Road South and Bensfort Road (see Appendix A) are designated as medium capacity arterial roadways serving both local as well as commuter traffic accessing Highway 7/115. The speed limit on these roads is 50km/h, except in the areas of St. Patrick's Catholic Elementary School and Otonabee Valley Public School where the speed limit is reduced to 40km/h during school admittance and dismissal times. Crossing guards are provided at both schools to assist children crossing the roads during these periods. River Road South and Bensfort Road have a rural cross-section with no curb and gutter. There is a concrete sidewalk on the west side of both roadways approaching the intersection however, there is no formal sidewalk connection through the intersection.

The intersection of River Road South and Bensfort Road is at a 40 degree angle and at this point, the intersection also serves Maxwell Avenue to the west and the north leg of Bensfort Road to the northwest. Both Maxwell Avenue and the north leg of Bensfort Road are under stop sign control. On the southwest corner of the intersection there is a child daycare centre (Sunshine Daycare) opposite to the entrance to Highland Park Funeral Centre.

Traffic Operational Review

The traffic operational review included the following data collection and analysis:

- Vehicle volume,
- Vehicle speed,
- Collision history,
- Sight line measurements,
- Pedestrian volume and;
- Site observations.

Vehicle Volume

Total two-way traffic volume on River Road South / Bensfort Road varies between 6,500 and 7,900 vehicles per day during the week (Monday to Friday) and between 4,300 and 5,800 vehicles per day during the weekend. The Transportation Association of Canada (TAC) guidelines suggest that 5,000 – 20,000 vehicles per day is typical for the average daily volume on an arterial road. While the City does not undertake annual traffic counts on every arterial road, there have been a number of counts done as part of other studies that suggest many other medium capacity arterial roads in residential areas of Peterborough have traffic volumes within this range. A few examples include Armour Road (11,900 / day), Cumberland Avenue (6,300 / day), Fairbairn Street (14,600 / day), Hilliard Street (4,900 / day) and Monaghan Road north of Charlotte Street (16,000 / day). The average daily volume on River Road South and Bensfort Road is within the TAC guidelines for an arterial road, and is typical of other medium capacity arterial roads in the City.

Bensfort Road (north leg) is a local urban road that carries approximately 400 vehicles per day. Bensfort Road (north leg) does not have sidewalks and vehicles are under stop sign control at the River Road South / Bensfort Road intersection.

Maxwell Avenue is a local road with a rural cross-section that carries approximately 900 vehicles per day. Maxwell Avenue does not have sidewalks and vehicles are under stop sign control at the River Road South / Bensfort Road intersection. Maxwell Avenue is served by Peterborough Transit, Route 10 – Collison that travels east on Maxwell Avenue and turns north onto River Road South.

Vehicle Speed Study

The speed limit on River Road South and Bensfort Road is 50km/h. The vehicle speed study was conducted on both the north and south approaches to the intersection and it was found that 85% of the drivers on River Road South are travelling at or below 56 km/h, with the average speed recorded was 47 km/h. On Bensfort Road, 85% of the drivers are travelling at or below 57 km/h, with the average speed recorded as 51 km/h. These results are typical for an arterial road within the City of Peterborough.

The review of vehicle speeds within the 40 km/h school zone also found that when the flashing beacons were operational during school admittance and dismissal times, there was no significant vehicle speed reduction during these times.

Collision History

In the past five years, there have been five reported collisions within the intersection of River Road South / Bensfort Road. Of the five collisions, two involved southbound drivers losing control of their vehicle while on the curve, of which, one was weather related and the other was due to driver distraction. The other three collisions were head-on collisions. Two of these collisions were a result of a northbound vehicle losing control

along the curve on wet or icy roads and one involved a northbound vehicle turning left onto Bensfort Road (north leg) failing to yield to southbound traffic. Of the five reported collisions, four have resulted in personal injuries.

Sight Line Review

Stopping sight distances were measured for vehicles travelling southbound on River Road South and northbound on Bensfort Road approaching the intersection. Sight line distances were measured for vehicles turning from Bensfort Road (north leg) and Maxwell Avenue onto River Road South and Bensfort Road.

The stopping sight distance is the minimum distance required for a driver to perceive the need to stop plus the reaction and deceleration time to bring the vehicle to a complete stop for the prevailing operating speed. The measured stopping sight distance for vehicles travelling north on Bensfort Road is 215 metres and 160 metres for vehicles travelling south on River Road south, which exceeds the minimum requirements set out by the Transportation Association of Canada (TAC) design guidelines.

The review of sight lines for vehicles turning from Bensfort Road (north leg) and Maxwell Avenue onto River Road South and Bensfort Road reveal that the sight line to the north, from the stop bar on Bensfort Road (north leg) is restricted by a house located on the northwest corner of the intersection, although the measured sight distance of 150 metres still exceeds TAC design guidelines of 115 metres at the measured operating speed. From the Maxwell Avenue approach the sight lines are partially restricted by the grade to the south and the daycare centre on the southwest corner. To achieve the required sight distance drivers need to pull forward across the stop line and into the painted cross walk area.

All-way Stop Analysis

As part of the review, staff conducted an all-way stop warrant analysis. The key factors used to assess the need for the implementation of all-way stop control includes: collision experience, minimum vehicle volume, and traffic flow. The technical justification for the installation of an all-way stop requires a minimum of 500 vehicles entering the intersection for each hour during the peak eight hours of the day and an average of 4 or more collisions per year over a three year period that involve side road traffic failing to yield to through traffic. The warrants for the installation of all-way stop control were not met because of insufficient vehicle volume and the primary collision patterns do not involve side road traffic entering River Road South / Bensfort Road.

Curve Advisory Speed Analysis

Curve warning signs with advisory speed tabs are required in advance of a curve in the road when a speed reduction is necessary for a vehicle to safely negotiate the curve. A Ball-bank test is used to determine the need for advisory speed signs. A ball-bank indicator is mounted in a vehicle and the readings are taken at different speeds along

the curve. These readings measure the combined centrifugal force, vehicle roll and super elevation of the road. The ball-bank readings taken through the curve on River Road South and Bensfort Road indicate the appropriate operating speed to be 40km/h which represents a speed reduction of 10km/h from the posted speed limit.

Site Observations

Staff visited the area on several occasions to better assess the existing driving and environmental conditions. The geometric layout of the intersection is unconventional having through traffic, River Road South / Bensfort Road, travelling on the south and northeast legs of the intersection creating a large radius bend or curve in the road. The remaining two legs of the intersection, Maxwell Avenue and Bensfort Road (north leg), intersect midway on the outside of the curve on a skew angle. These intersecting streets result in an extra wide asphalt road surface, up to 15 metres wide, through the mid-point of the curve, and this creates a long break in the centreline pavement marking.

There are standard sized (90 cm x 90 cm) curve warning signs on the northbound and southbound approaches to the intersection, which also show the side road intersection legs on the west side of the curve. Staff also confirmed the presence of 40 km/h school zone flashing beacons on both the north and southbound approaches the intersection, which are operating appropriately.

Vehicles travelling northbound can see the alignment of Bensfort Road (north leg) from a long distance away due to the opening between the tree lines and the alignment of hydro poles, which may create the illusion that the road continues straight ahead. For drivers unfamiliar with the intersection, the full alignment of the curve in the road is not visible until they reach the start of the down slope leading into the intersection, located about approximately 90 m to the south. Northbound vehicles, approaching the intersection on the down grade were observed breaking before the entering the curve. Southbound vehicles approach the intersection on an incline and in dry conditions and most drivers negotiate the curve without having to reduce speed.

Scattered on the outside of the curve are various roadsides hazards such as utility poles and trees, some of which have been shielded by barriers. These barrier treatments include a steel guide rail on the northwest corner of the intersection where there is a large tree; and a concrete barrier curb on the west side of the curve (in between the Bensfort Road (north leg) and Maxwell Avenue approaches which is located beside a utility pole. The purpose of barriers is to deflect vehicles from hitting a hazard if a vehicle leaves the roadway. In addition to these fixed barriers, staff identified five concrete barrier curb stones in front of the Sunshine Daycare that were placed approximately twenty years ago to prevent vehicles from parking in front of what was then a convenience store, and blocking the sight lines of vehicles exiting Maxwell Avenue.

Discussion

The traffic operational review revealed that of the five collisions that occurred within the River Road South / Bensfort Road intersection, three vehicles crossed the centreline and two vehicles lost control and left the road. It was noted that three of these collisions occurred in wet or icy road conditions and four of these collisions resulted in personal injury.

During wet or icy conditions, the surface of the road provides less resistance than dry pavement against the centrifugal force encountered on curves. The ball-bank test confirms that vehicles need to reduce speed through the curve as the result of the existing curve radius. The overall geometric layout of the intersection, the deceptive alignment when approaching from the south, the extra wide asphalt road surface within the intersection, and the lack of centreline pavement markings through the most critical portion of the curve provide minimal visual guidance to the drivers entering the curve, particularly during adverse conditions. Road side hazards and the lack of a continuous accessible sidewalk increase the risk of personal injury when vehicles lose control on the curve.

To improve the geometry and operation of the River Road South / Bensfort Road intersection, staff is of the opinion that the intersection should be reconstructed and fully urbanized to meet today's engineering design standards. The approved 2017 City Capital Budget Ref 5.2.10 identifies the Reconstruction/Urbanization of River Road – Highway 7/115 in 2020 and beyond. An Environmental Assessment will be completed as part of this project to determine improvement needs in the medium and long term. It is anticipated that the medium term plan will identify the need to realign River Road South and Bensfort Road to improve the radius of the curve, re-configure the side road connections and potentially add turning lanes. In the longer term, widening to four lanes may be required if development proceeds in the Coldsprings area.

Interim Improvements / Recommendations

Based on the existing collision history and the lack of accessible pedestrian facilities at the River Road South / Bensfort Road intersection, staff looked for an interim solution to improve the operation of this intersection. The traffic operational review revealed that the majority of collisions occurred when drivers lost control of their vehicles while negotiating the curve. These collisions were due in part to driver's failure to reduce their vehicle speed sufficiently to negotiate the curve during poor weather conditions. To reduce the frequency of vehicles leaving the road it is necessary to improve guidance through the curve and provide added protection from existing roadside hazards.

Staff reviewed the criteria for the installation of steel guide rail and concrete barrier curb. In accordance with the Ontario Ministry of Transportation Roadside Safety Manual, for posted speeds under 60 km/h, barrier curb is the recommended option for roads within an urban environment. Guide rail itself is a fixed hazard, and while a vehicle striking the longitudinal face will often be redirected back into the through lane, vehicles striking an

unprotected end treatment can result in serious injuries to the driver. Therefore, a guide rail barrier can be effective on the outside of a curve provided it is continuous and not broken by openings created by driveways or intersecting roads. The installation of guide rail at this location where there is insufficient space between Maxwell Avenue and Bensfort Road (north leg) to install the necessary guide rail end treatments or crash attenuators would create a hazard to drivers in an area where it is known that vehicles leave the road. Based on the recent collision history at the intersection, the guiderail on the northwest corner of the intersection has been struck in the past, resulting in injuries to the vehicle occupants.

When a guide rail is installed where it is necessary to provide an opening, the ends of the guide rail require specialized end rail treatments or crash attenuators to prevent vehicle roll over and absorb the impact of the crash to reduce the potential for injury to vehicle occupants. End rail treatments or crash attenuators require a certain length of guiderail to properly work and there is insufficient space between the intersections to install the required length of guide rail to accommodate the end treatments or crash attenuators to prevent vehicle rollover and personal injury. Guide rail installed adjacent to Maxwell Avenue and Bensfort Road (north leg) would also block sight lines for vehicles turning on to River Road South and Bensfort Road and potentially increase the collision risk for this movement. The installation of a barrier curb on the curve, as recommended in the Roadside Safety Manual, would deflect the majority of vehicles from leaving the road surface and would provide sufficient clear zone between the road and the adjacent sidewalk or any fixed road side hazards.

The implementation of the concrete barrier curb on the outside of the curve will also narrow the pavement width, encouraging slower speeds and improving the guidance for southbound and northbound vehicles traversing the curve. The addition of this curb treatment will also allow for a partial realignment of the Bensfort Road (north leg) connection and will allow the stop line and crosswalk on Maxwell Avenue to be moved further east, which will improve sightlines at both locations and create a small boulevard area to allow for installation of the missing link of sidewalk between these side roads.

To increase driver awareness and provide positive guidance for northbound traffic the following is proposed:

- oversized curve warning signs with 40km/h advisory speed tabs will be installed;
- additional yellow centre dividing line markings through the curve will be painted;
- white edge line pavement markings will be painted; and
- retro-reflective, post mounted delineators will be installed throughout the curve on both sides of the road.

These measures should assist unfamiliar drivers recognize the alignment and severity of the curve during adverse weather conditions and encourage them to slow down to an appropriate speed to better negotiate the curve.

A sketch of the concept improvements are shown as Appendix B.

Through this report it is recommended that these improvements be incorporated into the Engineering and Construction Division work program for implementation during the 2018 construction season. In the interim, staff will proceed with the implementation of oversized curve warning signs and 40 km/h advisory speed tabs on River Road South and Bensfort Road approaching the intersection.

Timelines

If the recommendations are approved, detailed design and construction of the intersection improvement concept plan will be scheduled for 2018. Depending on availability of staff, the design might occur in 2017.

Summary

The River Road South / Bensfort Road traffic operational review has shown that the vehicle speed, sight lines and existing signage meet or exceed TAC and OTM guidelines. Despite this, a review of the intersection collision history shows a consistent collision pattern involving drivers losing control of their vehicles through the curve on wet or slippery pavement. The review also identified the need for improved pedestrian facilities and the installation of roadside delineation to increase driver awareness and provide positive guidance through the curve during adverse weather conditions.

As an interim measure, staff will install oversized curve warning signs and 40km/h advisory speed tabs on River Road South and Bensfort Road in advance of the intersection to increase driver awareness of the curve ahead and highlight the need to reduce speed.

Submitted by,

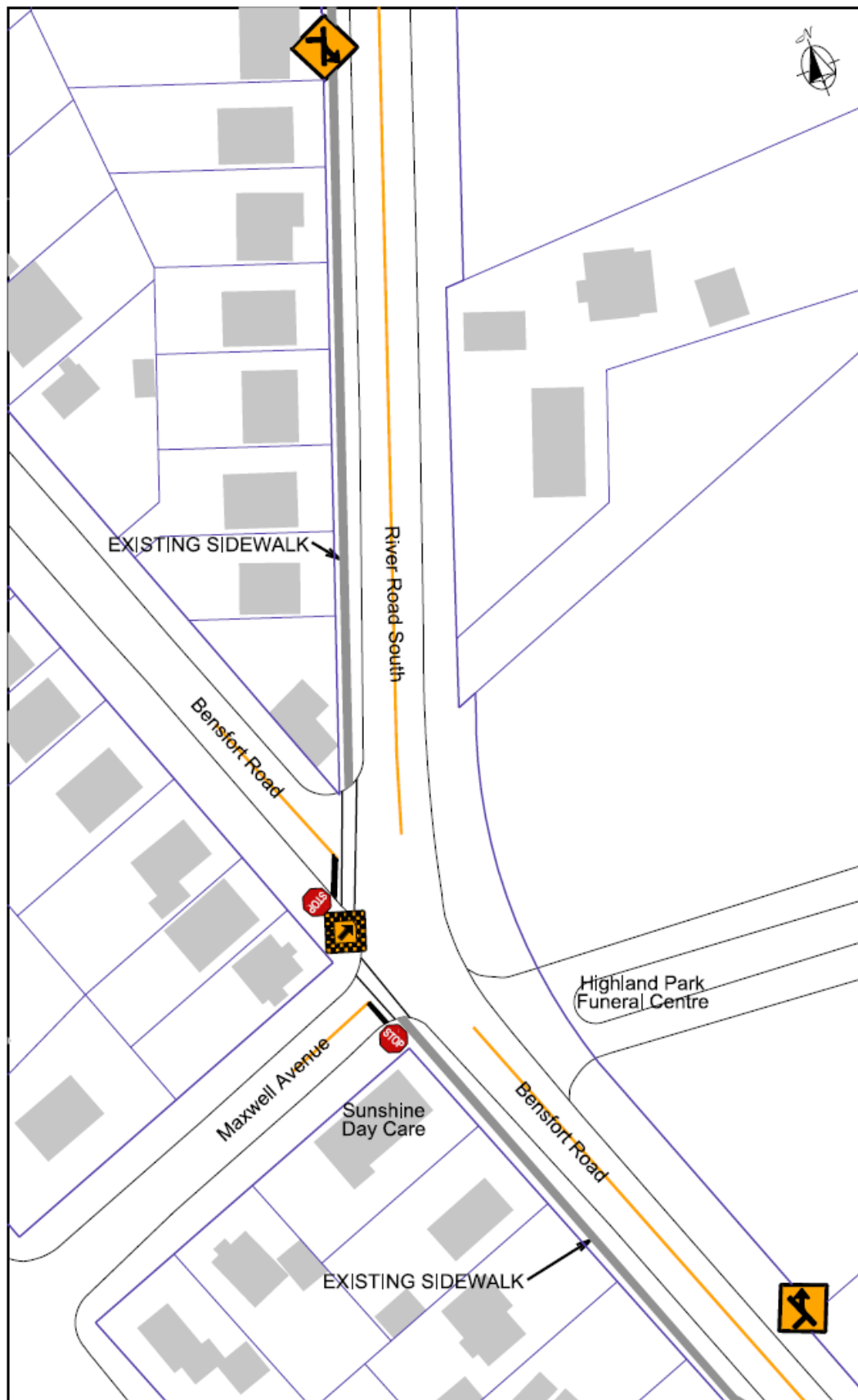
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Attachments:

Appendix A: River Road South / Bensfort Road Area Diagram
Appendix B: Intersection Improvements Concept Plan

Appendix A: River Road South / Bensfort Road Area Diagram



Appendix B – Intersection Improvements Concept Plan

