



City of  
**Peterborough**

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**To:** Members of the General Committee

**From:** W.H. Jackson, Commissioner of Infrastructure and Planning Services

**Meeting Date:** June 6, 2018

**Subject:** Report IPSTR18-012  
Hunter Street East / Armour Road Traffic Operational Review

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## **Purpose**

A report to present the findings of the Hunter Street East / Armour Road Traffic Operational Review.

## **Recommendations**

That Council approve the recommendations outlined in Report IPSTR18-012 dated June 6, 2018, of the Commissioner of Infrastructure and Planning Services, as follows:

- a) That Countdown Pedestrian Signals, Ladder Crosswalk pavement markings, and a Leading Pedestrian Interval be implemented at the intersection of Hunter Street East and Armour Road; and
- b) That a 40 km/h speed limit be implemented on Hunter Street East between Rogers Street and Ashburnham Drive.

## **Budget and Financial Implications**

The implementation of countdown pedestrian signals, signing, revised pavement markings will cost approximately \$20,000, funds for which are available in the 2018 Capital Budget for Intersection Pedestrian Safety Enhancements (Project Reference 5-13.03).

## **Background**

In response to parent concerns, staff initiated an operational review of the Hunter Street East / Armour Road intersection specifically related to pedestrian safety. Parents whose children attend King George Public school expressed concerns with the number of recent vehicle-pedestrian collisions at the intersection and pedestrian safety.

Council, at their meeting of December 11, 2017 approved Report USTR-17-019 which addressed some of the immediate concerns by implementing a Crossing Guard at the Hunter Street East and Armour Road intersection to cover the morning school crossing period in addition to the existing afternoon crossing guard shift.

This follow up report represents the completion of the operational review.

## **Traffic Operational Review**

The traffic operational review was conducted to assess and confirm the existing operation of the Hunter Street East / Armour Road intersection and identify and examine the merit of implementing enhanced pedestrian safety infrastructure. The technical assessment consisted of the following data collection and analysis:

- Vehicle volume,
- Vehicle speed,
- Collision history,
- Pedestrian volume,
- Traffic Signal Operation and;
- Site observations.

## **Existing Conditions**

Hunter Street East is a two-lane arterial road running from the Otonabee River in the west to Ashburnham Drive in the east. Armour Road is a two-lane arterial road running from Maria Street in the south to Nassau Mills Road in the north. These roads intersect on a hill with approach grades in excess of eight-percent. The intersection of Hunter Street East and Armour Road is controlled by traffic signals and has designated left-turn lanes on Hunter Street and marked crosswalks on all four-legs of the intersection. King George Public School is located on the northeast corner of the intersection and an adult crossing guard is present to assist school children crossing the intersection during school admittance and dismissal times.

The King George Public School site has been identified by Kawartha Pine Ridge District School Board as the preferred location for a new elementary school to replace the existing King George and Armour Heights Public Schools. Council, at their meeting of April 9, 2018 in considering Report PLPD18-013, rezoned a portion of 300 Hunter Street

East to facilitate the development of the new elementary school on the King George Public School site. The final site plan and roadway and entrance improvements necessary for the new school will be the subject of a separate report to Council at the time of site plan approval. The recommendations from this report are not impacted by any additional changes that would be required to support the new school construction project.

Across from King George Public School, the Skyline Westclox Building, located on the southeast corner of the intersection, houses a mixture of professional, commercial, and residential units. A sketch of the subject area is shown in Appendix A.

The operational review identified the following key transportation characteristics in the study area:

- The total two-way vehicle volume on Hunter Street East and Armour Road varies between 3,000 and 6,000 vehicles per day with the majority of vehicles travelling on Armour Road north of Hunter Street and on Hunter Street west of Armour Road.
- The speed limit on Hunter Street East and Armour Road is 50 km/h. Analysis of the vehicle speed study determined that 85% of drivers on Hunter Street and Armour Road are travelling at or below 54 km/h and 52 km/h respectively, with the average speed recorded between 45 - 47 km/h.
- A review of the collision history revealed there has been on average 3 collisions a year over a three-year period. Of the nine collisions, two were vehicle-pedestrian collisions, in both cases, the driver was charged with failing to yield to the pedestrian.
- Over a 12 hour period (7:00 A.M. – 7:00 P.M.), a total of 476 pedestrians were recorded crossing at the intersection. There are approximately 113 pedestrians crossing during the A.M. Peak Hour (8:15 am – 9:15 am) and 122 pedestrians crossing during the P.M. Peak Hour (3:00 pm – 4:00 pm).
- The traffic signals at Hunter Street East and Armour Road currently operate in a semi-actuated mode with vehicle/pedestrian detection on Armour Road. When no vehicles or pedestrians are present on Armour Road the traffic signals stay green on Hunter Street with the pedestrian walk signal on to cross Armour Road. There are left-turn lanes on Hunter Street but no left-turn signals.
- The traffic signal cycle length at this intersection is 65 seconds and is running a 50/50 split giving 50% of the green time to Hunter Street and 50% of the green time to Armour Road. The traffic signals are timed in coordination with the Rogers Street intersection to reduce the need for vehicles to stop on the steep hill in winter conditions. The pedestrian Walk/Don't Walk signal timing exceeds

the minimum time recommended in the Ontario Traffic Manual (OTM) Book 12: Traffic Signals.

- The Level of Service (LOS) at signalized intersections is used to describe the quality of traffic flow under various operating and geometric conditions and may be defined in terms of delay and the probability of clearing vehicles that arrive at the intersection. The levels of service range between LOS A (relatively congestion-free) and LOS F (congested). While OTM Book 12 suggests LOS A is ideal, LOS C or D are typical for urban arterial road intersections with a speed limit of 50 km/h. Using signal timing and analysis software along with current intersection vehicle / pedestrian counts, staff established that the intersection of Hunter Street East and Armour Road is operating at a LOS B with delays averaging 12.8 seconds per vehicle.
- Staff visited the intersection on various occasions to gather data and better assess the existing environmental conditions. Observations confirmed all required pavement markings and signage including school area and school crossing signs have been implemented, and conform to Ontario Traffic Manual and Highway Traffic Act standards. In the vicinity of the intersection there are No Parking and No Stopping restrictions on both sides of Hunter Street and on the east side of Armour Road. Parking is permitted on the west side of Armour Road beyond 30 metres of the intersection. Despite the parking restrictions, staff observed parents parking on Hunter Street while picking up or dropping their children at school. These parked cars and the crest of the hill contribute to reduced sight lines for drivers exiting the driveway at King George School and Museum Drive.
- Eastbound vehicles approach the intersection on a steep upgrade. Although sight lines are clear and the traffic signals are unobstructed, staff observed that drivers making a left-turn at the intersection on a green light appeared hesitant as they look ahead for vehicles cresting the hill in the opposite direction. As a driver, it may be more difficult to judge the speed of an oncoming vehicle cresting a hill which in this case would increase the decision sight distance beyond the crest of the hill.

## Discussion

Analysis of the Hunter Street East and Armour Road intersection revealed collision history, vehicle speed and vehicle volumes to be typical for an intersection serving two arterial roads. The traffic signals are operating at a LOS B, providing minimal delay to vehicles and pedestrian traffic. A detailed review of the collision history failed to identify a consistent collision pattern. Of the two vehicle-pedestrian collisions, both were the result of the driver failing to identify and yield to the pedestrian in the crosswalk while

turning left at the intersection. These collisions occurred on two different legs of the intersection in dry weather during daylight hours and at different times of the day.

The pedestrian count revealed a significant number of pedestrians crossing the intersection due to the two major pedestrian generators in the area, King George Public School and the Skyline Westclox Building. This pedestrian activity is expected to increase with the proposed expansion of King George Public School, the new Canadian Canoe Museum, and future residential development in the immediate study area plus future development within the Lift-Lock Secondary Planning Area. To improve pedestrian safety at the Hunter Street East and Armour Road intersection, staff examined various intersection pedestrian safety enhancement options.

### **Intersection Pedestrian Safety Enhancements**

There are four approaches to enhance pedestrian safety at a signalized intersection. Geometric Design Treatments, Pavement Marking Enhancements, Traffic Signal Equipment Upgrades, and Traffic Signal Operational Changes.

#### **Geometric Design Treatments**

Geometric design treatments at intersections typically include changes such as the construction of corner bulb-outs, median pedestrian refuge islands and reduced curb radius. Due to the small size of the intersection and property restrictions, staff eliminated the option of corner bulb-outs and median pedestrian islands. A reduced curb radius is an effective way of reducing turning traffic speeds as well as making pedestrians more visible as they wait to cross the roadway. The City of Peterborough Engineering Design Standards recommends a minimum curb radius of 10.7 metres. The current curb radii at the intersection of Hunter Street and Armour Road are 6.5 metres and as such the existing curb radii should not be further reduced given the school bus turning movements at this intersection.

#### **Pavement Marking Enhancements**

Pavement markings within a signalized intersection typically include two parallel crosswalk lines which delineate the path for pedestrians to cross. Other forms of enhanced crosswalk markings recommended in the Ontario Traffic Manual include Ladder Crosswalks and Textured Crosswalks. Ladder Crosswalks include larger crosswalk lines and incorporate longitudinal stripes to enhance the delineation of the pedestrian crosswalk. Textured Crosswalks typically include a coloured patterned surface that is designed to contrast the roadway. Similar to Ladder Crosswalks, they increase the visibility of a pedestrian crossing and increase drivers' awareness.

#### **Traffic Signal Equipment Upgrades**

Traffic signal upgrades for pedestrians include Pedestrian Countdown Signals to supplement the flashing "Don't Walk" indication. The Pedestrian Countdown Signals

display the number of seconds remaining for a pedestrian to cross the road during the flashing don't walk indication, and have been shown to enhance the pedestrian's understanding and awareness of the remaining time to cross the roadway. They are effective at intersections with a high percentage of seniors, children, and mobility-challenged pedestrians.

### **Traffic Signal Operational Changes**

Operational changes to traffic signal timing for pedestrians can include use of an Exclusive Pedestrian Phase or Leading Pedestrian Intervals (LPI). An Exclusive Pedestrian Phase is an isolated walk/don't walk phase where vehicle movements are red in all directions allowing pedestrians to walk freely without vehicle conflict. Exclusive Pedestrian Phases are typically used where pedestrian crossing volume is extremely high. Exclusive pedestrian phases can reduce the risk of vehicle-pedestrian conflict associated with turning traffic; however, other restrictions will be required such as "No Right on Red" to eliminate all conflicts. Exclusive Pedestrian Phases are often found in downtown locations in major cities, such as downtown Toronto. Technical guidelines established by the City of Toronto require a minimum of 2,000 to 3,000 pedestrians per hour during an eight hour period to warrant their use. Implementation of an Exclusive Pedestrian Phase has other impacts on the signalized intersection such as increasing delays for pedestrians and vehicles, pedestrian-motorist confusion, and a reduced LOS.

A Leading Pedestrian Interval (LPI) is a signal phasing enhancement designed to improve pedestrian visibility in locations with heavy volumes of turning traffic and frequent pedestrian crossings. During the LPI, motor vehicles expecting the green light are stopped for four to seven seconds while pedestrians are given the walk signal. This allows pedestrians to begin crossing ahead of vehicle turning movements which allows them to clearly establish themselves in the crosswalk making them more visible to the motorist.

Criteria used to determine if an intersection is a candidate for leading pedestrian intervals are; high turning movements combined with heavy pedestrian volume, high collisions due to left and right turning vehicles, school crossing locations and intersections with high levels of citizen complaints due to aggressive driving. Leading Pedestrian Intervals present challenges at traffic signals coordinated by a central traffic control system. In these cases, coordination with nearby intersections is dropped to allow the LPI to be implemented, which may result in added congestion and a reduced level of service at the intersection. Leading Pedestrian Intervals are not recommended at intersections with advance left-turn movements as these left turn phases are given priority to clear out the left turning traffic, and the pedestrian phase is delayed until the advance green is completed.

### **Pedestrian Safety Enhancements / Recommendations**

The vehicle speed study showed that 85% of the drivers on Hunter Street East are

travelling at or below 54 km/h which is typical for an arterial road within the City. Site observations identified steep road grades, reduced sight lines at the crest of the hill and illegal on-street parking in front of King George School during admittance and dismissal times. Combined, these characteristics complicate the driving environment and as such a reduced speed limit of 40 km/hr on Hunter Street East is appropriate.

The key to enhanced pedestrian safety at an intersection is driver awareness. When drivers are expecting to see pedestrians they generally modify their speed and are more cautious when negotiating an intersection. Enhanced crosswalk pavement markings or Ladder Crosswalks highlight the presence of pedestrians and define the pedestrian area.

The collision history identified that both of the recent vehicle-pedestrian collisions occurred when vehicles were making a left-turn maneuver at the intersection. Staff investigated the option of implementing advance left-turn signals on Hunter Street. The left-turn warrant within the Ontario Traffic Manual requires a consistent one or two cycle delay for left-turning motorists during peak periods and a collision pattern which would be corrected by the implementation of an advance left-turn signal. A review of the intersection concluded that the left-turn warrant is not satisfied.

As the intersection does not have advanced left-turn phases, staff reviewed the possibility of implementing a Leading Pedestrian Interval to allow pedestrians to begin crossing ahead of vehicle turning movements making them more visible to drivers. Traffic signal analysis software shows the inclusion of the advance a Leading Pedestrian offers very little change to the existing LOS: however, implementation should be limited to peak pedestrian times to allow for signal coordination with the Hunter Street / Rogers Street intersection at other times of the day.

In addition to driver awareness, pedestrian awareness is equally important. Pedestrian Countdown Signals enhance the pedestrian's understanding and awareness of the remaining time to cross the roadway. They are effective at intersections with a high percentage of seniors, children, and mobility-challenged pedestrians. Based on the results of the pedestrian study combined with the potential expansion of a new larger school at King George Public School site, staff suggests Pedestrian Countdown Signals at this intersection will enhance pedestrian safety.

## **Summary**

The Hunter Street East / Armour Road Traffic Operational Review has shown that collision history, vehicle speed, and vehicle volumes to be typical for an intersection of two arterial roads. The review has also identified restricted sight lines on Hunter Street, a significant number of pedestrians crossing at the intersection, and vehicle-pedestrian collisions that may be attributed to a lack of driver awareness. These conditions create a complex condition for both drivers and pedestrians that would be improved by:

- the implementation of Countdown Pedestrian Signals;
- enhanced Ladder Crosswalk pavement markings;
- a Leading Pedestrian Interval during peak pedestrian times; and
- a 40 km/h speed limit on Hunter Street East from Rogers Street to Ashburnham Drive.

The Kawartha Pine Ridge District School Board is planning a new elementary school on the existing King George School Site. While some additional roadway and entrance improvements may be necessary for the new school, these recommendations will be the subject of a separate report to Council at the time of site plan approval. The recommendations from this report are not impacted by any additional changes that would be required to support the new school construction project.

Submitted by,

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Attachments:  
Appendix A - Hunter Street East / Armour Road Area Diagram



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