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Halifax Regional Council
September 7, 2004

TO: Mayor Kelly and Members of Halifax Regional Council

SUBMITTED BY: _____
Ken Reashor, P.Eng., Traffic Authority

DATE: August 31, 2004

SUBJECT: Improvements to the Armdale Rotary

INFORMATION REPORT

ORIGIN

This report was prepared by Traffic & Transportation Services to educate members of Regional Council on the topic of 'Modern Roundabouts', to explain the legislative changes to the Nova Scotia Motor Vehicle Act (Rotaries and Roundabouts) proposed by the Province for the fall sitting of this year, to inform members of Council on the work of the Provincial Roundabout Committee, to relay the work that has been done to date at the Armdale Rotary and to outline the proposed work plan for evaluating improvements at the Rotary.

BACKGROUND

The Armdale Rotary was constructed in 1955. Prior to its construction, the roadway pattern consisted of a Y intersection of Herring Cove Road, St. Margaret's Bay Road and Chebucto Road, and a link over a bridge to a cross-intersection formed by Chebucto Road and Quinpool Road/Dutch Village Road. Construction of the Rotary transformed the junction into a five-legged intersection consisting of the rotary circle itself and five feeder legs.

Design capacity of the Rotary was based on a volume of 20,000 vpd. In 1960, the AADT on the Rotary had already exceeded 18,000 vpd and in 1973 the AADT was approximately 51,000 vpd. Today, the AADT is about 55,000 vpd.

In 1967, a third lane was constructed along Herring Cove Road from the Rotary to Purcell's Cove Road. The center lane became contra-flow northbound (inbound) in the AM and southbound (outbound) in the PM. At this time, an exclusive right turning lane was also provided from Herring Cove Road to Quinpool Road, and St. Margaret's Bay Road was widened to provide a truck lane.

In the mid-70's, signals were installed at 3 locations to control traffic flow (see attached brochure - RotaryPavMkgs.gif). Since the late 70's, commissionaires have been controlling the circulatory lanes across the Quinpool Road leg during the PM peak (4:00pm-5:30pm, weekdays). All general traffic is forced to use Quinpool Road to access downtown during this period. Only buses, taxis and emergency vehicles are able to access downtown via Chebucto Road.

The 2002 Traffic Capacity Opportunity Study looked at various intersection alternatives for the Armdale Rotary. One of the alternatives considered the conversion of the Rotary to a Roundabout.

DISCUSSION

Roundabouts

Roundabouts are circular intersections having specific design features and widely-used in many parts of the world, namely Europe and Australia. Roundabouts are becoming more popular in North America. Today there are about 500 roundabouts located in the United States and about 15 in Canada. Nova Scotia has three rotaries—Armdale, Pictou and Port Hastings—but no roundabouts.

A roundabout is defined by three basic principles that distinguish it from a rotary or traffic circle:

1. Yield-at-Entry: Vehicles approaching the circular intersection must wait for a gap in the circulating flow, or yield, before entering the circle. Some rotaries currently use the yield-at-entry rule, however, the Armdale Rotary does not apply this operating technique.
2. Traffic Deflection: Traffic entering the roundabout is directed or channeled to the right with an appropriate curved path (30 to 60 degrees) into the circulating roadway. The angled entry will direct traffic and reduce entry speeds.
3. Geometric Curvature: The radius of the circular road and the angles of entry can be designed to slow

the speed of vehicles. The aim is to reduce speed at the entry points to the roundabout where drivers decide whether it is safe to proceed.

Advantages of Roundabouts versus other intersection alternatives:

- reduced number of conflict points compared to other non-circular intersections. A roundabout has 8 vehicle-to-vehicle points of conflict compared to 32 conflict points for a typical 4-way intersection.
- a roundabout has 8 vehicle-to-pedestrian points of conflict compared to 24 conflict points for a typical 4-way intersection
- roundabouts are self-regulating
- elimination of high angles of conflict and lower operational speeds, resulting in fewer and less severe accidents
- reduced decision-making at point of entry
- reduced delay as compared with an equivalent volume for a signalized intersection
- reduced maintenance costs (eg. signals (heads, loop detectors, controllers) and power is eliminated)
- UK experience has shown that for similar traffic loads, roundabouts return an injury rate half that of traffic signals

The following links may prove useful in understanding the operation of roundabouts:

Canada:

Roundabouts Canada: www.roundabouts.ca

Hamilton, ON: www.city.hamilton.on.ca/public-works/Roads-And-Traffic/roundabout.asp

USA:

City of Sammamish, Washington: www.ci.sammamish.wa.us/RoundaboutDemo.aspx

City of Clive, Iowa: www.ci.clive.ia.us/events.htm

Provincial Modern Roundabout Committee

The Modern Roundabout Committee, formed in May of 2003, has been working to establish solutions to concerns surrounding Modern Roundabout implementation. The Committee, chaired by Keith Boddy, consists of representatives from the Nova Scotia Department of Transportation and Public Works (NSTPW) and HRM. The Committee has been active with activities designed to establish modern roundabouts as an alternative design for intersections in Nova Scotia and to educate people on the differences between a modern roundabout and a rotary.

The Committee has developed the attached brochure with the assistance of Communications Nova Scotia. This brochure will be very important in the ongoing campaign to educate the general public on the safety advantages and operating simplicity of the modern roundabout.

One accomplishment of the Committee was to draft a change to the Motor Vehicle Act adding the term 'Modern Roundabout' and clarifying the rules of how to drive them. Specifically, the change will indicate

that all vehicles approaching the circle will yield to those already in the circle. The amendment is waiting to be passed at this fall's sitting of the Legislature.

In May 2004, NSTPW coordinated a three-day training session by TMS Consultancy (a UK training and safety audit firm). The training included a one-day executive briefing and field trip to potential modern roundabout sites and a two-day design workshop attended by almost 30 participants from NSTPW and numerous consultants and government officials from all four Atlantic Provinces.

Analyses of the Armdale Rotary

In the Spring of 2004, Traffic & Transportation Services commissioned TMS Consultancy to undertake a preliminary analysis of the feasibility of converting the Armdale Rotary to a modern roundabout. The consultant prepared a horizontal alignment that would operate safely. The proposed geometric changes provide adequate entry path curvature and entry angle (which contribute significantly to safe operation) for each entry arm.

The consultant analyzed the proposed layout using ARCADY 5 to assess queues, delays, and capacities at each arm. ARCADY 5 is the most commonly used software in the UK for the analysis of roundabouts.

The study concluded that the Armdale Rotary could be successfully converted to a modern roundabout.

Table 1. ARCADY 5 Results: Average No. Vehicles in Queue

Approach	7:45am - 9:15am	4:45pm-6:15pm
Chebucto Rd.	less than 1	4
Dutch Village Rd.	less than 1	2
St. Margaret's Bay Rd.	5	2
Herring Cove Rd.	1	1
Quinpool Rd.	less than 1	3

The consultant recommended a publicity and information campaign to precede the introduction of changes and some on-site assistance (possibly by the commissionaires) for the first few weeks of operation.

In addition, the consultant notes that there may be a re-distribution of traffic that would need modeling after the principle of yield-on-entry has been established as a method of control (and the peak hour queues effectively disappear).

ARCADY 5 operates on gap acceptance and assumes that once vehicles are on the roundabout, there are

adequate lanes and no restriction on vehicles leaving the roundabout. Any exit link restrictions may interfere with the operation of the roundabout.

Future Analyses

There are concerns with the ability of the Armdale Rotary legs to accommodate traffic exiting the circle. Specifically, Chebucto Rd (AM) and St. Margaret's Bay Road (PM) are currently severely congested, with vehicles sometimes backing up onto the rotary during peak times.

There are several micro-simulation software programs available that have the ability to model the Rotary, taking into account upstream and downstream traffic and bottlenecks. We have contacted experts in two of these software programs: VISSIM and Paramics. We propose to hire one of these firms to create a micro-simulation model to determine how well the Rotary would operate as a roundabout and to identify any improvements which may be required.

The micro-simulation software models the movement and behaviour of individual vehicles and transit on local arterial and regional freeway networks. They specifically employ a steering logic on the circulatory roadway to track a vehicle from an entry point to an exit.

The selected consultant will build the existing roadway network, calibrate and validate the model, model the proposed operation, and provide a technical report and CD ROM. The CD ROM will show a movie file of how the model operates at present along with a comparison of how it would operate in future with the proposed geometric changes. The consultant will also provide a visual version fo the software to watch these simulations.

The Department does not intend to proceed with any construction work at the Armdale Rotary until:

- the Motor Vehicle Act legislative changes have been approved;
- the final results of the micro-simulation modelling shows that the improvements to the Rotary will be effective;
- funds are approved from the Infrastructure Ask program; and
- Regional Council has approved the project.

BUDGET IMPLICATIONS

There are no budget implications.

FINANCIAL MANAGEMENT POLICIES / BUSINESS PLAN

This report complies with the Municipality's Multi-Year Financial Strategy, the approved Operating, Capital and Reserve budgets, policies and procedures regarding withdrawals from the utilization of Capital and Operating reserves, as well as any relevant legislation.

ALTERNATIVES

There are no recommended alternatives.

ATTACHMENTS

Brochure

Additional copies of this report, and information on its status, can be obtained by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

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