REGION OF OTTAWA CARLETON — REPORT
RÉGION D'OTTAWA CARLETON — RAPPORT

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Your File/V/Réf.

DATE 31 March 1999

TO/DEST. Co-ordinator Transportation Committee

FROM/EXP. Director Mobility Services and Corporate Fleet Services
Environment and Transportation Department

SUBJECT/OBJET **WALKING SECURITY INDEX**

DEPARTMENTAL RECOMMENDATION

That Transportation Committee recommend Council receive the report prepared by Dr. Barry Wellar of the Geography Department of the University of Ottawa, entitled *Walking Security Index* (on file with the Regional Clerk) and approve the recommendations as set out in this report.

BACKGROUND

The Walking Security Index (WSI) Project was approved as a 1996-97 initiative of the Transportation Environment Action Plan (TEAP). As stated in the project Terms of Reference, the project was designed to contribute a pedestrian's perspective on the level of security (safety, comfort and convenience) engendered by intersections and intersection design under different road networks and traffic situations in Ottawa-Carleton.

The study was conducted by Dr. Barry Wellar of the University of Ottawa's Geography Department.

Specifically, the WSI project was designed to :

1. improve understanding of pedestrian navigation, flow, and storage patterns and behaviours at major intersections. Three related research initiatives are central to realizing the goal of improved understanding, and they are summarized as follows:

    a) to better and more completely identify the variables involved in pedestrian decisions and activities;

b) to better specify the relationships among the variables which describe pedestrian decisions and activities;

c) to better describe and explain the relations between pedestrians and vehicle operators. An important part of this work is to investigate whether WSI is an appropriate instrument for representing pedestrian interests, using level of service (LOS) for vehicle operators as the basis of comparison;

2. obtain pedestrians' views on the factors that directly and indirectly affect their sense of security (safety, comfort, convenience, other) at intersections;

3. identify hazards and constraints affecting safe, comfortable and convenient pedestrian movement at intersections; and

4. identify generic and site-specific intersection modifications that serve and promote pedestrian security (safety, comfort, convenience, other).

The Walking Security Index Final Report was distributed to the Chair and Councillors on 08 October 1998.

The report is a culmination of all research activities undertaken to date for this project, including those represented in the Interim Reports and other publications produced as part of the project documentation. Copies of the Interim and Final reports are available from the University of Ottawa for a nominal cost.

The final report contains the following sections:

- Study Objectives and Background;
- Specification of Walking Security Variables;
- Specification of the Walking Security Index; and
- Proposed Intersection Modifications that Serve and Promote Basic Pedestrian Needs.

It is recommended that Council receive the Final Report and authorize staff to use the indices as pilot studies, refine and quantify the variables to make them more useful in the field, and implement certain of the proposed intersection modification recommendations contained therein, as discussed below.

Some of the intersection modification recommendations staff cannot support, and the reasons are discussed below.

DISCUSSION AND RECOMMENDATIONS

The final report sets forth several indices to use when evaluating intersections for quality of service to pedestrians, as described below.

The operational purpose of the Walking Security Index is as follows:

1. to provide a means of better describing the walking security experience of pedestrians at signalized intersections;
2. to provide a means of better explaining why pedestrians' experiences differ from their expectations in regard to security; and
3. to provide a means of better predicting the consequences for pedestrians' security that are likely to occur as a result of intersection infrastructure modifications, and/or changes in the behaviour of users (vehicle operators, cyclists, pedestrians).

The formulation and description of the proposed indices follows.

The Basic Walking Security (BWS) Index

This index is described on pages 69-74 of the final report. It is a composite index score (number) that ranks signalized intersections according to the likelihood that pedestrians' security expectations are matched by experiences. It is the product of two sub-indexes, one representing the pedestrian and vehicle volumes of the intersection, the other representing the intersection geometry and operational characteristics. The higher the number, the lesser the degree of security.

Thus, BWS = (WPCE-PIP)*(IPC-F)

where:

WPCE-PIP is the Weighted Passenger Car Equivalent - Pedestrian Interaction Potential Index, and IPC-F is the Intersection Pedestrian Challenge Features Index.

The Weighted Passenger Car Equivalent - Pedestrian Interaction Potential Index (WPCE-PIP)

This sub-index is described on pages 41-47 of the report. It is an index score (number) that represents the quantity of potential interactions between pedestrians or vehicles (expressed as passenger car equivalents, i.e. heavy vehicles and buses = 1.7 automobiles) at signalized intersections. The hours to be used are not specified, but this must be determined by the user and applied consistently.

$$\text{WPCE-PIP} = (\text{PASSENGER CAR EQUIVALENTS/HR})^2 * \text{PEDESTRIANS/HR}$$

The Intersection Pedestrian Challenge Features (IPC-F) Index

This sub-index is described on pages 50-69 of the report. It is an index score (number) that represents the magnitude of challenge to pedestrians' security caused by intersection features.

It is the product of the following six variables. Table 8 in the report assigns a rating to each of the six geometric features. A total of 1,296 points is possible. A much more

detailed definition of the factors will be required in order to enable users to calculate the index in a rigorous and consistent manner.

IPC-F = NLR*NTLTR*IGR*ISR*DTFLR*NCR

where:

NLR = number of lanes (1-4 points)

NTLTR = number of (left) turn lanes by type (1-6 points)

IGR = intersection geometry rating (intersection angle) (1-3 points)

ISR = intersection slope rating (approach grade) (1-3 points)

DTFLT = direction of traffic flow rating (# of one- or two-way approaches) (1-2 points)

NCR = number of (right-turn) channels adjacent to intersection (1-3 points)

1. It is recommended that the Basic Walking Security Index (BWS) and its component sub-indices, the Weighted Passenger Car Equivalent-Pedestrian Interaction Potential Index (WPCE-PIP) and the Intersection Pedestrian Challenge - Features Index (IPC-F), be adopted for use in evaluating Regional intersections, initially as a pilot study.

<u>The Quality of Infrastructure Condition (QIC) Index</u>

This index is described on pages 47-50 of the report. It consists of a checklist assessment of the physical condition of an intersection. Eighteen features are noted, with +1 assigned if the feature is acceptable, -1 if not, and -.5 if partially acceptable. The points are added (scores can range from -18 to +18). The following features are evaluated:

1. sidewalk corner capacity;
2. height of curbing;
3. condition of curbing;
4. sidewalk width;
5. sidewalk curb condition;
6. roadway surface conditions;
7. median (refuge) capacity;

8. median (refuge) condition;

9. traffic calmers;

10. channel island capacity;

11. crosswalk capacity;

12. crosswalk signed and painted;

13. stop bar painted and signed;

14. pedestrian signage;

15. no sightline obstruction;

16. street furniture proximal to sidewalk corner;

17. ice/snow/slush removal; and

18. water drainage.

2. It is recommended that the Quality of Infrastructure Condition Index (QIC) be adopted for use in evaluating Regional intersections, initially as a pilot study.

Aggressive Driving Indices

The report proposes four "Aggressive Driving" indices. The first three relate to vehicles running red and amber lights, and are expressed as the ratio of vehicles running red/amber lights to total vehicle volumes. These indices do not reflect whether or not a given vehicle had the *opportunity* to run a red light, i.e. many vehicles included in the calculation arrive during a red interval or the beginning of a green interval and could not possibly run the red. A more useful index presently used by the Department relating to *signal cycles* rather than number of vehicles is proposed for adoption. It is the ratio of the number of signal cycles containing red-light runners to the total number of signal cycles in which vehicles approach at the end of the green interval and therefore have the opportunity to run the light.

3. It is recommended that in place of the three Aggressive Driving - Red and Amber Indices proposed, an index defined as *the ratio of the number of signal cycles containing red-light runners to the total number of signal cycles in which vehicles approach the intersection at the end of the green interval* be adopted for use in evaluating Regional intersections.

The fourth "Aggressive Driving" index proposed is the "Fail-to-Yield" index and is the ratio of number of vehicles failing to yield to the total number of vehicles. This may not

provide a valid comparison because it does not distinguish between vehicles arriving when pedestrians are present and those arriving at other times. A more valid index would be a count of the actual number of pedestrian conflicts, pedestrians delayed and pedestrians changing course. These factors are currently surveyed at problem intersections.

4. It is recommended that in place of the Aggressive Driving: Fail-to-Yield (ADFY) Index proposed, the survey of the actual number of *pedestrian-vehicle conflicts, pedestrian delays and pedestrians changing course* continue to be used as the measures to evaluate Regional intersections.

Recommendations for Intersections that Serve and Promote Basic Needs of Pedestrians

The report sets forth a number of generic and site-specific intersection modifications that serve and promote pedestrian security.

5. It is recommended that the following intersection modifications be approved (numbering corresponds to recommendations in WSI Final Report):

a. install red-light cameras - this is Council policy;

d adjust light cycle duration on the green phases - staff routinely time signals to allow for longer crossings when required;

f. increase and vigorously enforce crosswalk and stop line/stop bar By-laws - this is an important safety measure;

g. restrict right turns on red: pilot program - this measure is undertaken wherever justified for safety reasons;

i. in place of changing Section 140, petition the Government of Ontario to add the sections contained in the Transportation Association of Canada's *Canadian Model Rules of the Road*, entitled "PEDESTRIAN CROSSWALK", "PEDESTRIAN - CROSSING AT OTHER THAN CROSSWALK", and "DUTY OF DRIVER TO PEDESTRIANS", to the *Highway Traffic Act* in order to properly recognize the risk to pedestrians in crosswalks and channels (text attached at Annex A) - Section 140 deals specifically with rules at Pedestrian Crossovers, not pedestrian crosswalks in intersection channels. The Region has removed all pedestrian crossovers and is not installing any new devices of this type, so this section no longer applies in Ottawa-Carleton. There is justification for adding sections to the *Highway Traffic Act* to make it more "pedestrian-friendly", however. The term "crosswalk" is defined in the Act, but crosswalk regulations are only defined for signalized intersections or pedestrian crossovers. Adding those sections from the *Canadian Model Rules of the Road* listed in Annex A would more clearly set forth the duties of pedestrians and drivers at crosswalks at unsignalized locations, including right-turn cut-offs.

k. **change "yield to pedestrian" signs to "stop" signs: pilot program** - staff are currently investigating this change for the southwest quadrant of the Laurier-Nicholas intersection;

m. **provide proper maintenance**;

n. **"desire-line walking": pilot project** - this signal phasing option could possibly be considered at a limited number of candidate intersections. The potential benefit depends on the proportion of pedestrians crossing two legs of the intersection. It should only be considered if it can be shown there is a net benefit. Some other cities have had a negative experience and have removed it. There is concern that motorists will think signals are malfunctioning and proceed on red creating a hazard for pedestrians;

o. **ensure adequate lighting from the pedestrians' perspective**;

p. **ensure adequate sight lines from the pedestrians' perspective**; and

q. **modify and standardize intersection features so as to eliminate obstacles and nasty surprises that make intersection usage difficult and even dangerous for pedestrians with disabilities**.

6. It is recommended that the following intersection modifications <u>not</u> be approved:

b. **install camera radar and strictly enforce the 60 kph maximum** - photo radar is no longer legal in Ontario. Sixty kph speed limits in the vicinity of signalized intersections on 70 and 80 kph roadways are impractical and unworkable. Speed limits must be contiguous along major sections of a roadway;

c. **increase separation of stop lines/stop bars from crosswalks** - the currently used spacing is as specified as the norm to be used by the Ontario Manual of Uniform Traffic Control Devices (OMUTCD). This Manual sets the standards of professional practice for the design and operation of traffic signals in Ontario. This proposal will increase hazards to pedestrians as some may cross outside the crosswalk in areas where turning motorists will not be watching for them. The location where drivers are required to stop is standardized across the Province. If observance of stop bars is to be rigorously enforced as the author suggests, then stop bars should remain in their standardized location. Moving the location of stop bars would require the relocation of approximately 2,200 vehicle sensors at a cost of $1,200 each;

e. **remove pedestrian walk signals: pilot study** - the Region follows recommendations of the OMUTCD which specifies conditions under which pedestrian heads should be used. Contrary to statements in the report, pedestrian heads serve an important purpose as they provide a separate clearance interval for pedestrians, the duration of which is timed for the length of the specific crosswalk

at the intersection. Pedestrian heads separate conflicting pedestrian and vehicular movements. This is especially important when left turning movements are controlled by arrow indications. Staff have tried to determine (so far unsuccessfully) the availability of pedestrian heads which provide an acceptable indication to pedestrians but limit the visibility to drivers. This effort is continuing;

h. **modify light cycles: eliminate delays from red to green** - the timing and the indications of the vehicle clearance interval (amber and all-red) is strictly specified by the OMUTCD. It is designed to allow motorists who are too close to stop, to clear the intersection before conflicting traffic gets a green. The standard contained in the OMUTCD is also a Canadian and North American standard. Not following this standard would put pedestrians and motorists in grave danger. It is the opinion of the Legal Department that not applying the standard consistently across the Region would create a hazard and would expose the Region to liability;

j. **modify posted and painted roadway signage: yield to pedestrians** - if the current signage is found to be ineffective at a specific location, the solution may be to upgrade the control to a stop sign or signal control, or to increase enforcement. While staff will keep abreast of on-going research or pilot studies in this area, there appears to be little additional enhancement possible to the Yield control, signing or pavement marking schemes currently in use; and

l. **modify roadway marking materials: paint** - road paint currently used is the most durable available. Other more durable road marking materials are available and the Region does use them at certain critical locations such as Bank Street at the Towngate Mall and the Slater Street lane shift; however, they are 20 times more costly than paint and last only three times as long as paint. Currently the average cost to paint an intersection is $120.

CONSULTATION

An extensive consultation process was an integral part of Dr. Wellar's team's work programme, and is described in his report.

This Departmental report, in draft form, was placed on the Region of Ottawa-Carleton's website on 15 January 1999 for the information of and comments from the general public. Advice on how to obtain a copy of Dr. Wellar's report was included. In addition, on 29 January 1999 this report was circulated to 13 community groups, business groups and transportation-related organizations. As of the report submission date (01 April 1999) no responses have been obtained. It is understood, however, that the Ottawa Pedestrian Advisory Group (OPAG) and the Audible Pedestrian Signals Group may be providing written comments, which will be made available to the Transportation Committee.

FINANCIAL IMPLICATIONS

Increased staff costs may be anticipated for data collection efforts required to calculate the WSI at given intersections. Intersection modifications to address pedestrian issues would be funded from existing capital programmes.

Approved by
Doug Brousseau

GM/sc

ANNEX A

SECTIONS OF THE *CANADIAN MODEL RULES OF THE ROAD* BY THE TRANSPORTATION ASSOCIATION OF CANADA RECOMMENDED FOR ADDITION TO THE ONTARIO *HIGHWAY TRAFFIC ACT*

PEDESTRIAN CROSSWALK

(1) Where traffic control signals are not in place or not in operation when a pedestrian is crossing the roadway within a crosswalk, a driver shall yield the right-of-way to the pedestrian by slowing down or stopping if necessary.

(2) A pedestrian shall not leave a curb or other place of safety and walk or run into the path of a vehicle that is so close that it is impracticable for the driver of the vehicle to yield.

(3) Where a vehicle is stopped or slowing at a crosswalk to permit a pedestrian to cross the roadway, the driver of any other vehicle approaching from the rear shall not allow the front extremity of his/her vehicle to pass beyond the front extremity of the other vehicle.

PEDESTRIAN - CROSSING AT OTHER THAN CROSSWALK

Except when under the protection of a school crossing guard, when a pedestrian is crossing a highway at a point other than within a crosswalk, he/she shall yield the right-of-way to traffic.

DUTY OF DRIVER TO PEDESTRIANS

Notwithstanding any other provisions contained herein a driver shall

(a) exercise due care to avoid colliding with a pedestrian who is upon a roadway; and

(b) when necessary, give warning by sounding the horn, or in the case of a cyclist, give warning by an audible warning device.

VERBAL PRESENTATION

1. WALKING SECURITY INDEX
- Co-ordinator, Transportation Committee report dated 3 Nov 98

The Acting Commissioner, Doug Brousseau, introduced Dr. Barry Wellar of the University of Ottawa, who was invited to do some research on the Region's behalf to develop tools staff could use to measure the level of comfort and security of pedestrians at intersections. Staff will be providing a response to this report at a later date.

Dr. Wellar explained that the purpose of this study was to recognize the fact that pedestrians have a series of expectations and experiences about their walking security, but the two are not the same. The study examined safety, comfort and convenience as the three driving concepts. He referred to the Highway Capacity Manual in which convenience - not safety - was the primary concern, and stated that this document has driven the automobile industry and transportation in North America for over thirty years. He stressed that everyone should be treated equitably with regard to transportation and all are entitled to convenience, safety and comfort. Dr. Wellar provided a detailed overview of the variables used to determine the three concepts, as detailed in his report. He also highlighted the criteria developed to evaluate those variables.

Dr. Wellar remarked that the Walking Security Index builds on and draws from the Regional Official Plan and the Transportation Master Plan (TMP) and therefore, Council should have regard for that work when it makes recommendations that affect pedestrian security. During the study, many area residents complained about the Ontario Municipal Board's (OMB) tendency to favour developments that generate more automobile traffic. However, if the Region's priority is pedestrian, cyclist, transit, automobiles, this should be clear to the OMB when they are making such decisions. Further, he suggested a copy of the report be sent to the OMB for information purposes because there is a modal restructuring in Ottawa-Carleton of which the OMB should be apprised.

Dr. Wellar reminded committee that this is original research that has not been done before and therefore must be examined carefully. He emphasized that the indexes need to be tested with standard evaluation criteria i.e. effectiveness, efficiency, transparency, et cetera. He advised that the Region should test them to ensure the users and intended users who are ultimately affected by what the Region does, are comfortable with this index. With regard to the suggestion for pilot projects, he stressed that much of this research is exploratory and hoped others will examine it and provide feedback. He believed it was necessary to carry out some pilot studies because he did not know conclusively the affect of this study. He maintained that

if the indexes are used correctly, the Region could very well get into a very logical, systematic and progressive modification program.

Councillor Cantin questioned whether he had reviewed the effectiveness of mid-block crossings and Dr. Wellar indicated that during their research they did uncover some information about these types of crossings and suggested there were areas in the Region where they would be successful. Unfortunately, their limited funding did not permit them to examine this further. The councillor made note of the various methods employed by different jurisdictions to address pedestrian crossing problems.

Councillor Davis asked whether his studies uncovered ways of improving pedestrian access at busy streets, particularly for children and seniors. Dr. Wellar indicated that one of the indexes is an audit form which would enable the Region to rank each intersection, based on specific variables. He advised that if the intersection cannot be modified for physical reasons, then it will be necessary to modify pedestrian and motorist behaviour. The councillor highlighted the difficulty experienced by pedestrians when signals are widely spaced along a busy stretch of road and the requests this has sparked from the community for pedestrian signals and she inquired whether he had alternative suggestions. Dr. Wellar explained that for decades decisions have been made on land use and when a problem is created as a result, the answer is usually sought through transportation means. He emphasized that land use must take into account the transportation-related consequences for all modes.

Councillor Doucet noted that at times the dangers are not caused by land use, but by the types of roads that are built. He questioned whether there is an answer to make roads safer and Dr. Wellar believed that one way that may influence drivers is to impose stricter fines. He agreed it entailed an attitude adjustment on the part of drivers and pedestrians.

Councillor Cantin agreed there was a requirement to provide more education for pedestrians. He questioned whether his research examined the possibility of stopping traffic in all directions and having just one pedestrian movement. Dr. Wellar indicated that one of the recommendations in the report is desire line walking which has been very successful in some U.S. cities. He explained the crossing is corner to corner and reduces the time a pedestrian is exposed. In his report, he proposed that the intersection of Laurier and Elgin would benefit from such a pilot project.

Councillor McGoldrick-Larsen questioned whether the Region should be submitting this document along with the Region's Official Plan and its TMP to the OMB as suggested by Dr. Wellar and questioned whether the OMB take those factors into account when it is making decisions on land use. The Planning and Development Approvals Commissioner, Nick Tunnacliffe believed the Board

would only be interested in the report as evidence in part of a case. He doubted that sending the material to them would have any influence, unless it had relevance to a particular issue they were hearing.

That the Transportation Committee receive this verbal presentation for information.

RECEIVED

CITY CENTRE COALITION
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February 3, 1999

Councillor Diane Holmes
Chair, Transportation Committee
Regional Municipality of Ottawa-Carleton
111 Lisgar Street
Ottawa, Ontario
K2P 2L7

Dear Councillor Holmes:

Walking Security Index

The City Centre Coalition is a grouping of nine community organizations (Centretown, Dalhousie, Hintonburg, Dow's Lake, Glebe, Old Ottawa South, Ottawa East, Sandy Hill and Carleton University Students' Association). We support measures that improve safety and comfort for pedestrians and which enhance walking as a viable mode of transportation.

We have examined the "Walking Security Index" report which the Region commissioned and the recommendations from staff with respect to the report. We trust that the measures that the Region will soon adopt as a result of the report will be a first step and that any recommendations made in the "Walking Security Index" report that are not immediately adopted will be considered in the near future, once the initial implementation of measures has been evaluated.

First, we support immediate implementation of all those recommendations that are supported by both the "Walking Security Index" report and the staff.

As well, we urge Council to implement the following:

Recommendation b - We recognize that the Province does not currently authorize photo radar for speed control. However, we urge the Region to press the Province to authorize photo radar which has proved itself an effective means of enforcement.

Recommendation j - Rather than take the approach that there appears to be little additional improvement possible to the Yield control, signing or pavement markings currently in use, we urge taking an active approach to seeking and trying improved signs and markings. As well, we support the use of stop signs.

Recommendation i - We urge that road markings be kept in better condition through the use of more durable paint or more frequent painting. Many markings become invisible and useless when the roads are wet at night.

We look forward to improved safety for pedestrians, as well as people on bicycles and in automobiles, when the Region adopts these measures.

Sincerely,

Original signed by

Campbell Robertson
Chair, City Centre Coalition