HALIFAX
REGIONAL MUNICIPALITY

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Item No. 2
Halifax Regional Council
July 23, 2013

TO: Mayor Savage and Members of Halifax Regional Council

SUBMITTED BY: Original Signed by Director

Jane Fraser, Director of Planning & Infrastructure

DATE: June 11, 2013

SUBJECT: **Current Evaluation Tools and Standards for Wind and Shadow Studies**

INFORMATION REPORT

ORIGIN

Motion put and passed by Regional Council on May 24, 2011:

"MOVED by Councillor Watts, seconded by Councillor Walker that staff provide a report on the current evaluation tools and standards that HRM requires of developers for wind studies and shadows."

LEGISLATIVE AUTHORITY

Section 229(1)(g) of the *Halifax Regional Municipality Charter*.

BACKGROUND

HRM has 21 separate community plans. The consideration of wind and shadow impacts differ within each of these community plans, based upon the issues at the time in which the plan was adopted, the nature of the plan area, and whether tall buildings are a normal feature in the area.

This report outlines the existing municipal planning strategy policy context for considering wind and shadow impacts. It also outlines the evaluation tools and standards for considering each impact condition.

DISCUSSION

Policy Context:
Wind and shadow impacts are addressed to varying levels of detail within HRM's community plans, as follows:

1. In the Downtown Halifax Secondary Municipal Planning Strategy and Land Use By-law, there are specific criteria that need to be met with regard to wind, in considering any building proposal exceeding 20 metres in height.[1]

2. Under the Halifax Municipal Planning Strategy, buildings which are proposed to exceed the established height precincts of the Spring Garden Road Sub-Area (Peninsula Centre Area Plan) may only be considered through the development agreement process. In evaluating any application to exceed the established height precincts, Council is mandated by policy to ensure that any proposed development does not cast a significant amount of shadow on the Public Gardens during the period of the year during which the Public Gardens is open to the public.

3. In the Halifax, Sackville Drive, Bedford, and Downtown Dartmouth municipal planning strategies, there are general policy criteria that are to be considered in evaluating any development agreement or land use by-law amendment (rezoning). A typical clause is as follows:

   "Policy WF-T8 *It shall be the intention of Town Council to have regard for building, street and open space configurations in relation to wind and sun to minimize adverse winter climatic effects."* (Bedford Municipal Planning Strategy)

4. In most other community plan areas, there are very broad planning policy criteria within the municipal planning strategies that *could* be used to consider wind and shadow impacts stemming from a development agreement or a rezoning application. An example of this is Policy IM-12 of the Timberlea/Lakeside/Beechville Municipal Planning Strategy, which states the following:

   "IM-12 *In considering development agreements and amendments to the land use by-law, in addition to all other criteria as set out in various policies of this strategy, Council shall have appropriate regard to the following matters:*

   (c) *that controls are placed on the proposed development so as to reduce conflict with any adjacent or nearby land uses by reason of:*

[1] Shadow impact studies are not required in Downtown Halifax, as shadowing was considered during the development of the built form regulations.

(vi) any other relevant matter of planning concern."

Generally, the level of detailed criteria requirements corresponds to the type of development that typically occurs in each community plan area, as well as the age of the plan. Downtown Halifax is a location where relatively tall buildings are both proposed and planned for and it has a new community plan; therefore, it has relatively detailed criteria concerning wind impact. However, it is observed that some taller buildings are increasingly being proposed outside of Downtown Halifax; therefore, as community plans are revised, and particularly through the development of the Regional Centre Plan, it is expected that new regulations concerning wind and shadow impacts will be implemented.

Wind Impact Assessments:

Evaluation Tools

There are two kinds of wind impact assessments:

(1) quantitative wind impact assessments; and
(2) qualitative wind impact assessments.

1. The quantitative assessment relies on scale model simulation analysis, which typically involves wind tunnel testing or computational fluid dynamics. Boundary layer wind tunnels are used by engineers who specialize in wind engineering, or related disciplines, to quantify the wind impacts of proposed developments. The wind impacts of a proposed development are determined by measuring wind velocities using wind speed sensors along a scale model of the built environment into which the proposed development is planned to be introduced.

   Two sets of measurements of the built environment model are taken:
   - one with the proposed development site either vacant or with existing buildings (existing conditions); and
   - another set of measurements with a scale replica of the proposed development inserted into the model.

   Both sets of measurements are then compared to determine the changes in wind circulation patterns and velocities. The wind tunnel testing methodology, using scaled models in wind tunnels to simulate real-life phenomena at full scale, has been proven to be highly reliable by the scientific and engineering community.

   Recent advancements in computational fluid dynamics have opened up the possibility of using computers to quantify the wind impacts of proposed developments. However, based on the continued use of scaled model tests, the technology may not be advanced or reliable enough (at this time) to fully replace wind tunnel testing as the industry standard for quantitative wind impact assessments. This may change with time, as limitations with current computer resources are overcome.

2. A qualitative wind impact assessment, on the other hand, does not rely on quantifiable measurements. Instead, it is the statement of a professional opinion in regards to the anticipated wind impacts of a proposed project, which is based on acquired knowledge and experience. A qualitative assessment is appropriate for developments that are minor in scope, such as a small addition in building height or a development where wind impact is not

expected to be detrimental, and provided that the professional is able to make a definitive conclusion about a project.

Standards

Pedestrian wind comfort assessments are undertaken to determine the impacts of a given proposal on the pedestrian realm, which includes sidewalks, walkways, building entrances, and open spaces on both public and private property. These wind assessments are concerned with both the comfort and safety of pedestrians. The comfort level for pedestrians is directly related to the activities planned for the pedestrian realm around the proposed development (sitting, standing, or walking) and the percentage of time in which favourable wind speeds are achieved for a given activity. Sitting is the activity that is the most sensitive to the presence of wind, while walking is the activity least impacted by the presence of wind.

In terms of safety, the goal of a pedestrian wind comfort assessment is to determine the amount of seasonal events in which wind gust speeds, or sustained wind speeds, are equal to or exceed a threshold wind speed at which a pedestrian's balance and footing could be adversely affected (typically around 88 km/hour). The safety assessment would take into account naturally occurring wind events that would exceed the threshold for all areas of the Municipality, whether it be a fully built out area, a large public open space, or a forested area.

If a wind evaluation determines that negative conditions will arise from a building proposal, the building design is typically altered to address the issue. This may result in significant building design changes or minor alterations, such as the installation of canopies or vegetation to serve as wind barriers. HRM staff reviews such matters with designers when a building is proposed.[2]

Shadow Impact Assessments:

Evaluation Tools

Modern shadow impact assessments are undertaken using 3D computer modelling software with a shadow output function. There are a number of software packages on the market that can perform this type of work. However, the analysis of the output itself needs to be undertaken by a qualified professional. Typically, the shadow analysis is performed from dusk to dawn on four dates of the year, which roughly represent the equinoxes[3] (March 21st and September 21st) and the solstices[4] (June 21st and December 21st). The analysis compares the shadow impacts created

[2] It is important to note that in reviewing applications, HRM staff assess both the findings of the studies and the qualifications of the authors.

[3] Equinox is defined as "either of the two corresponding moments of the year when the Sun is directly above the Earth's equator. The vernal equinox occurs on March 20 or 21 and the autumnal equinox on September 22 or 23, marking the beginning of spring and autumn, respectively, in the Northern Hemisphere (and the reverse in the Southern Hemisphere). The days on which an equinox falls have about equal periods of sunlight and darkness." Reference: http://www.thefreedictionary.com/equinox

[4] Solstice is defined as "either of the two corresponding moments of the year when the Sun is directly above either the Tropic of Cancer or the Tropic of Capricorn. The summer solstice occurs on June 20 or 21 and the winter solstice on December 21 or 22, marking the beginning of summer and winter in the Northern Hemisphere (and the reverse in the Southern Hemisphere). The days on which a solstice falls have the greatest difference of the year.

by the proposed development with the shadow impacts created by the existing site conditions (site as vacant or with existing buildings). A good shadow impact analysis also takes into account the shadow impacts from surrounding buildings, other structures, and natural elements in the landscape (i.e. Citadel Hill).

Standards

HRM planning policies are mainly concerned with shadow impacts of new developments on public open spaces. The essence of a shadow analysis is to determine first and foremost if there is a worsening of the shadow casting situation from the existing site conditions (without the proposed development). In addition, all buildings and structures will cast a shadow, so a good portion of the analysis must be concentrated on if a proposed development will cast a level of shadowing that is deemed unacceptable. This determination will depend on when the additional shadow is being cast, the extent of the shadow casting, the duration of the shadow casting, and the types of uses that are being made of, or are being planned for, the area that will receive additional shadow casting. There may be other specific concerns to take into account such as the type of plant material that may be impacted in a public park.

HRM staff reviews shadow studies to determine the impact of shadows, which may include reviews by specialized staff when considering impacts on parks and plant materials.[5] In addition, changes to buildings may be suggested to mitigate impacts, which may result in the narrowing of buildings, or other reductions in size, so as to limit shadow cast.

FINANCIAL IMPLICATIONS

None

COMMUNITY ENGAGEMENT

This report is being provided to Regional Council for information on current planning policies, regulations and practices. As such, community engagement was deemed unnecessary.

ATTACHMENTS

None

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between the hours of daylight and darkness, with the most daylight hours at the beginning of summer and the most darkness at the beginning of winter."
Reference: http://www.thefreedictionary.com/solstice

[5] In reviewing applications, HRM staff assess both the findings of the studies and the qualifications of the authors.

A copy of this report can be obtained online at http://www.halifax.ca/council/agendasc/cagenda.html then choose the appropriate meeting date, or by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

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