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BLINDED BY THE LIGHT: LIGHT POLLUTION BY-LAWS

Shortly after I joined the Town of Markham I was asked by one of our councillors to work with other municipal staff on a light pollution by-law, a by-law intended to reduce light shining where it did not need to be. My first reaction, having worked on many by-laws over the years, was one of scepticism; would such a by-law merely be another example of over-regulation, with very little effective enforcement? Would restricting the use of lights seriously affect the safety of both people and vehicles? However, after reading material from organizations such as the International Dark-Sky Association (IDA) and other scientific journals regarding the harmful effects of too much light on the night sky, hormonal rhythms and energy consumption, and speaking with the councillor and the lighting expert retained by the Town, it became clear that light pollution is an issue that has far-ranging negative consequences. While light pollution is an ill that can be remedied to a great extent, reservations regarding effective regulation and enforcement by municipal by-law are not so easily dispelled.

What is Light Pollution?

"Light pollution" is the light that is shone from any artificial light source into the upper atmosphere, obscuring the night view of the skies and, in certain cases, constituting glare and light trespass. Detrimental effects on humans, wild animals and the ability to study astronomy have all been reported as the result of excess light being shed by improperly shielded light fixtures and harmful lamp or bulb types. In many countries around the world, efforts are being

made to reduce wasted light without compromising pedestrian or vehicular traffic. Many states in the United States have passed light pollution legislation to limit light pollution from streetlights and other fixtures (ex. Connecticut, Arizona, Texas, New Mexico). In Canada, Calgary, Alberta undertook a program to retrofit 11,000 residential streetlights with new, lower-wattage flat lens fixtures from March to November, 2002. The Town of Richmond Hill passed a by-law in 1995 to regulate light pollution, primarily in an effort to assist the University of Toronto David Dunlap Observatory.

What Can be Done about Light Pollution?

This paper will focus on four options available to municipalities to reduce and regulate light pollution:

i) a municipal by-law;

ii) design guidelines for use in the planning process and restrictions in development agreements;

iii) corporate policies regarding municipally-owned and operated facilities; and

iv) partnerships and incentive programs.

A. Light Pollution By-laws

1. Statutory Authority

Section 129 of the *Municipal Act, 2001*, S.O. 2001, c. 25 (Ontario) provides as follows:

> 129. (1) A local municipality may prohibit and regulate with respect to noise, vibration, odour, dust and outdoor illumination, including indoor lighting that can be seen outdoors.

Restrictions

(2) A by-law under subsection (1) shall not,

(a) require light fixtures used in conjunction with commercial, industrial, institutional, agricultural or recreational uses to be turned off at any time the use is actually being conducted;

(b) require an illuminated outdoor advertising sign, on the premises of a business, to be turned off at any time the business is open to the public; or

(c) require light fixtures used to illuminate any area for emergency, security or public safety purposes to be turned off at any time the illumination is necessary for those purposes.

Permit

(3) A by-law under subsection (1) may prohibit the matters described in that subsection unless a permit is obtained from the municipality for those matters and may impose conditions for obtaining, continuing to hold and renewing the permit, including the submission of plans.

While the Act clearly gives Ontario municipalities the authority to regulate outdoor illumination, it does not give a great deal of direction as to how municipalities should exercise that authority. The next part of the paper sets out some of the key areas that a municipal lawyer, when drafting or reviewing a light pollution by-law, should consider. Sample by-laws are attached to this paper for further reference.

2. Definitions

As with every by-law, a comprehensive list of well-defined terms is an assist in interpreting and understanding the by-law. In a light pollution by-law several of the terms that apply are quite scientific. The challenge for the municipal lawyer will be to draft definitions that are easily and clearly understood by the public who must comply with the by-law and by the municipal law enforcement officers who must enforce it.

While there are several definitions that will have to be included, for the purposes of this paper, some of the more common definitions are :

"Full Cut-Off Fixture" means a fixture, as installed, that is designed or shielded in such a manner that all light rays emitted by the fixture, either directly or indirectly from the fixture, are projected below a horizontal plane running through the lowest point on the fixture where light is emitted;

"Glare" means an intense light that results in discomfort and/or a reduction of visual performance and visibility;

"Light Pollution" means any adverse effect of artificial light including, but not limited to, light trespass, glare, uplighting, the uncomfortable distraction of the eye, or any artificial light that diminishes the ability to view the night sky;

"Light Trespass" means any light that falls where it is not wanted or needed, generally caused by a light from a property which shines onto the property of others.

The last three definitions highlight one of the basic difficulties with a light pollution by-law. As light pollution is not as quantifiable a harm as toxic chemicals are, the definitions have a subjective element to them. The Courts have held, on several occasions, that a subjective standard in a by-law impedes the ability of the public to understand the nature of the offence created, and thereby prevent a breach of the by-law, and have quashed such provisions on the basis of uncertainty and vagueness. By-laws require a certain level of precision to resist legal challenges. The language in the definitions above that speaks to "discomfort" and light that is "not wanted" suggest that the test is one of a municipal law enforcement officer's discomfort and distaste and will be susceptible to challenge as a result. Where more precise language applies or actual measurements, as suggested in the definition of "full cut-off fixture", are available they should be used.

3. Purpose

The *Municipal Act, 2001* does not stipulate that a light pollution by-law must have a defined purpose, unlike licensing by-laws passed pursuant to section 150. However, given that a light pollution by-law has a significant public education component, a listing of the purposes in the by-law itself, and not only in the recitals, may be useful. Some of the objectives that a light pollution may have are:

- to protect against direct glare and excessive lighting;
- to provide for safe roadways for motorists, cyclists and pedestrians;
- to promote efficient and cost-effective lighting and help conserve energy;
- to promote urban design guidelines for effective lighting; and
- to preserve the night sky.

4. Application

A light pollution by-law may be drafted to apply only to private property. When doing so, however, the municipality should consider what steps it will take to ensure that it, too, complies with the spirit and intent of the by-law. Some of those steps, such as corporate policies for municipally-owned facilities, will be discussed below. When drafting an application section, counsel needs also to be cognizant of those entities over which it has no authority to regulate, such as lights required pursuant to aeronautics legislation. The by-law need not list every entity or use exempt from the by-law because of other federal, provincial or state legislation, but it certainly should not purport to regulate or prohibit same where such regulation or prohibition is clearly illegal.

5. Exemptions

Careful consideration should be paid to whether categories of lamp types or uses should be exempt from the application of the by-law. It may be that a municipality only wishes to target the worst light polluters, and not residential uses, in an effort to achieve significant light pollution reduction while ensuring public support and voluntary compliance. For example, a light pollution by-law may restrict the use of non-essential floodlights but permit persons to use such lighting for holiday events, such as Christmas. Alternatively, certain uses of lights may be permitted, but only for a limited period of time (i.e. holiday lighting is permitted from December 1 to January 10 in any given year).

Municipalities need to decide whether the overall objective is to bring about immediate compliance or eventual compliance, as old fixtures are replaced and new ones installed. If a municipality opts for immediate compliance, such that the owner of a car dealership must decide whether to keep the sales yard lights off, breach the by-law or replace non-compliant fixtures with new ones, then the municipality should have a good sense of the costs to an owner to bring about compliance in order to fully appreciate the effect of such regulation. A light pollution by-law may, in the alternative, opt to grandfather certain uses or fixtures for a period of time or until such time as the fixtures must be replaced. If council wishes to effect gradual compliance and relies on grandfathering provisions, particular care must be taken when drafting the events that trigger the installation and use of by-law compliant lights. When are old lamps to be replaced with energy-efficient alternatives? Do the grandfathered fixtures enjoy the exemption

indefinitely, for the purpose of repair and maintenance only, or do they have to be compliant by a certain date?

6. General Requirements

There is a very technical component to a light pollution by-law that may be best addressed through the consultation with a lighting expert or engineer. As with any by-law, however, the use of technical language can make the by-law virtually incomprehensible to the public and have a detrimental impact on effective enforcement and prosecution of offences. Some of the technical components that may need to be addressed are as follows:

i) Shielding:

A light pollution by-law will typically require that light fixtures have some type of shielding feature. It is one of the simplest methods to reduce light pollution and often the most inexpensive. However, in order to ensure compliance with shielding requirements, the by-law will have to be express as to what constitutes shielding. As can be seen in the definition of "full cut-off fixture" above, the shielding necessary is that which prevents light from being projected from the fixture above a certain point. A homeowner anxious to comply with the by-law needs to understand how to measure the projection and shield the light appropriately.

ii) Mounting Height:

The mounting height of a lamp on a post will have an impact on the amount of light that is shed. The higher up the post the lamp is placed, the wider the area that will be lit. A light pollution by-law may specify mounting height in an effort to reduce the non-necessary light. However, how the height is to be measured will have to be specifically described in the by-law. In some by-laws, the mounting height is to be measured by reference to the height above sea level from certain described locations. This type of definition may be incomprehensible to the average person and difficult to establish on a prosecution. It may be that the by-law would be better drafted if it limited the actual area lit by the fixture. For example, the by-law may provide for an offence where the light shines on more than is necessary (not just my walkway, but the entire front porch of my neighbour), or where the light from one fixture overlaps the pool of light from an adjacent fixture.

iii) Prohibited Times/Hours of Operation:

One method to cut down on light pollution and complaints associated with light from one source being a nuisance to other users is to provide in a by-law that certain types of lighting must be turned off at a certain time of the day or can only be used for a certain amount of time. For example, recreational sports lighting should be programmed, if in use, to turn off by 11:00 p.m. Light pollution by-laws could be drafted to make the use of light timers and sensor-activated lighting

compulsory for certain types of lamps or uses. It should be noted, however, that where the by-law places reliance on devices that are to work automatically, there should be imposed a corresponding obligation on the owner/operator to program the device appropriately. For example, the by-law should require owners to ensure that timers are used and kept in good working order, such "working order" to account for daylight savings time.

iv) Types of Lamps:

"Lamps" are defined as the part from which the light is produced. Certain types of lamps are particularly detrimental to their surroundings and consume considerable energy. Municipalities should consider whether a light pollution by-law should specify which lamp types are permitted (i.e incandescent, low-pressure sodium etc.). In some draft by-laws, "wavelength distribution requirements" are set out. This entails describing the permitted wavelengths of certain light within a range of nanometers. "Nanometers" are one billionth of a meter, which must be measured by using some type of light meter. A by-law requirement that speaks to a "range of nanometers" will require that the measurement be taken with precision. This will entail both a certain amount of training of the staff who are to take the measurements and equipment to perform the actual measurement. Where the proof of an offence relies on a measurement, then the witness who testifies on behalf of the prosecution will have to establish that he or she is proficient in taking and reading the measurements and that the device used to take the

measurements was accurate on the date in question. This will make prosecutions more susceptible to challenge, as cases involving breathalyzer evidence has shown.

v) Illuminance Levels:

Light is measured by illuminance levels which are expressed in "lux" or number of feet in candles (i.e. 64.6 Lux = 6 footcandles).[1] If a light pollution by-law seeks to regulate illuminance levels, the challenges regarding who takes the measurements and how they are taken discussed above apply.

vi) Permitting Process:

Where a by-law is drafted with prohibitions as to time and place, it may be advisable to provide sufficient flexibility in the by-law to permit a person to apply for relief from the by-law. For example, if there is a total ban on certain lighting after 11:00 p.m., it may be that the operator of a cultural event, which takes place on a weekend in a non-residential area, needs lighting for public safety to extend until the attractions close at 1:00 a.m. As these types of requests may be common, the drafter of the by-law may wish to include provisions to allow persons to apply for exemptions from the by-law. The by-law may be drafted simply to allow for relief from the by-law at the discretion of Council. However, municipal councils often do not want to see the length of their public meeting

[1] A footcandle is the international unit of illumination; it is the intensity of light falling on a sphere arranged one foot away from a source of light of one candlepower.

agendas increase. If the demand for exemptions is estimated to be high, drafters should consider setting out circumstances in which exemptions may be granted in order that municipal staff can issue the permit. Where a permitting system is included in the by-law, the by-law should include additional provisions that provide for appeals to be heard by committees of council for the neglect to issue or the denial to issue permits.

6. Enforcement and Prosecution Issues

The drafting deficiencies in a by-law are never more evident than when attempting to enforce or prosecute under it. Ambiguous and vague language are common issues and can be best managed by a very clear understanding of what the by-law is intended to regulate and how it is to regulate. In drafting a light pollution by-law, as with all public health and safety by-laws, it is important not to be over-zealous; the legitimacy of the goals does not relieve the municipality from the obligation to draft by-laws that are objective, comprehensible and enforceable.

Some of the issues that I have noted when reviewing light pollution by-laws are as follows:

- subjectivity versus objectivity: as noted in the definitions above, the harm being described in terms of "discomfort" connote a subjective element which is problematic. The "discomfort" a complainant/informant may experience, when approaching a porch light at dusk while wearing contact lenses after a long smog-alert day, may be more severe than in better circumstances. The drafter of a light pollution by-law should focus on using empirical measurements that can be taken

by a moderately-trained municipal law enforcement officer, where possible, to avoid accusations of subjectivity. Where that is not possible, councils can still opt to have a definition that has a strong subjective element, but they should be advised that such provisions may not withstand a judicial challenge.

- mandatory versus voluntary: many light pollution by-laws contain provisions that use voluntary language such as "all non-essential outdoor commercial lighting is encouraged to be switched off after closing hours and/or when not required". Such a requirement does not create an offence and cannot be enforced. While the goals of the increased use of shielded light fixtures and an overall reduction in energy consumption may be important elements of the recitals or the explanatory note of the by-law, the enunciation of "desires" has no place in the operative provisions of a by-law. They also can often be misleading; persons believe that the by-law provides for something that the Enforcement Department knows it can never achieve by order of compliance or by-law charges. The encouragement of voluntary measures should be set out in information circulars, newspaper articles and other vehicles of public communication.

- lack of entry authority: the *Municipal Act, 2001* provides for the express authority to enter for the purpose of inspection with respect to certain types of by-laws (i.e. section 115 no-smoking by-laws, section 118 scaffolding, trenches and safety devices, section 122 snow and ice). However, certain sections of the Act, while

they provide for the specific authority to pass by-laws, do not provide for the authority to enter for inspection and enforcement purposes. With respect to section 129 of the Ontario Act, the authority is directed to the regulation of outdoor illumination and indoor illumination that can be seen indoors but there is no express authority to enter for the purposes of inspection. For many types of offences created by a light pollution by-law, given that they likely can be seen from a public right-of-way or the backyard of a complainant, the lack of an express entry authority may not be problematic. However, where the by-law provides for offences the proof of which requires specific light measurements to be taken, the lack of authority to enter may mean that an officer cannot be sufficiently proximate to the light source to take the necessary measurements.

- expertise required: as pointed out above, some of the restrictions in light pollution by-laws require a certain level of expertise. A well-trained municipal law enforcement officer should have no difficulty understanding the offence provisions of a by-law. However, where sections are written to provide for measurements (i.e. mounting height, scope of illumination) then it may be that specific training of officers by lighting consultants will be necessary. These training costs, as well as the costs of any specialized equipment, should be factored into the total costs to a municipality of passing and enforcing a light pollution by-law.

7. Passing the By-law

The *Municipal Act, 2001* does not require a public meeting to be held prior to the passage of the by-law. Nor are municipalities required to publish the intention to pass a light pollution by-law in a newspaper of general circulation. However, as with most by-laws, voluntary compliance is the best result from an enforcement perspective. As many people feel that more light fixtures and brighter lamps mean greater personal and property security, public education is key to increasing the understanding of, and necessity for, this type of by-law. Constituents may need to be educated on how well-designed, properly shielded lighting will be as satisfactory as non-compliant lighting. An effective communications plan also goes a great distance in alleviating public concerns. If the benefits of a light pollution by-law are clearly set out, and the public is invited to comment on its appropriateness before enactment, there is a greater possibility that the rate of voluntary compliance will be high.

In terms of how the by-law should be brought to council for enactment, municipal staff should have a clear plan regarding if and when there will be public consultation. It may be advisable to educate the public and to gauge its "buy-in" of the by-law prior to bringing a report to committee and council. This can be done by informing the public of the harm of light pollution and the steps that can be taken by the municipality and members of the public to reduce that harm prior to by-law enactment. Such information might be given through newspaper advertisements, pamphlets, the municipality's website, constituent newsletters from individual councillors and through staff presentations at public meetings and events. The public may respond at such meetings or provide written comments in response to invitations for same. With very

controversial by-laws, municipals councils often strike volunteer-based committees to canvass public opinion prior to directing staff to initiate a by-law review. Such committees, in my view, have greater credibility if they are comprised of persons with some expertise in the subject content of the by-law and if they solicit the views of the public prior to making recommendations. The one disadvantage of such *ad hoc* committees is the amount of time it takes to strike the committee, engage in public consultations and report back to Council. Where a municipality opts to pass a light pollution by-law, but without any grandfathering clauses to protect existing uses, meetings should be arranged with affected stakeholders prior to enactment so that the municipality completes its homework as to the financial costs of compliance for such users. Understanding the impact regulation may have prior to enactment can save municipal councils some political embarrassment in the future. As there is real environmental benefit to a light pollution by-law, municipalities may also wish to tie information regarding light pollution to its other environmental initiatives. On occasion, individual councilors who take it upon themselves to learn about the negative effects of light pollution may decide to include the enactment of a light pollution by-law as an item on his or her term agenda. Such a "cheerleader" can infect the process with enthusiasm and be of significant assistance in educating other members of council. Even where a light pollution by-law is not passed, municipalities can still play a role in educating the public through their websites as to the steps that can be taken to reduce light pollution, trespass and glare and the potential energy savings associated with the move to energy-efficient lamps and reduced use.

B. Design Guidelines and Development Process

A municipal council that is considering enacting a light pollution by-law should also consider what other steps can be taken alone, or in conjunction, with such a by-law. One of the easiest methods is to deal with the design guidelines and required conditions that may be applied to development applications. The Town of Markham has several very significant historical areas that it takes great pains to preserve. Design guidelines apply to these areas to ensure the any new construction and features are in keeping with the heritage features. Municipalities should look closely to ensure that existing design guidelines, as they apply to all areas of the municipality, provide for lighting in the type and numbers that ensure compliance with a light pollution by-law. If a proposed by-law imposes standards that are more restrictive than design guidelines currently being applied, staff should examine such guidelines to determine if revisions are required to ensure consistency or if certain types of development should be exempt from the application of the by-law. Where a light pollution by-law is not enacted, design guidelines should, at the very least, be written with the objectives of the reduction of light pollution in mind.

Care must be taken in drafting a light pollution by-law, however, to ensure that any requirements and standards do not adversely impact on personal or property security. When researching the applicable standards, municipal staff may wish to consult with experts in Crime Prevention Through Environmental Design principles ("CPTED") for information regarding the use of lighting for crime prevention to ensure that a light pollution by-law is in keeping with these, and other design principles, that may already be used by municipal planning staff and encouraged by policing authorities.

Subsection 41(7) of the *Planning Act*, R.S.O. 1990, c. P.13 (Ontario) includes, as one of the permitted conditions of site plan approval, facilities for the lighting, including floodlighting, of the land or of any buildings or structures thereon. Municipalities could ensure compliance with a light pollution by-law through the site plan process. This is a much more expeditious, and ultimately less expensive, route to reducing light pollution as it avoids future retrofitting. At the Town of Markham, direction with respect to permitted lighting is included in its standard site plan agreement. The wording currently requires the owner to "design light standards and fixtures so as not to create glare onto other properties or onto public highways through adequate altitude and shielding light sources".

C. Corporate Policies Regarding Municipally-Owned or Operated Facilities

Where a municipal council opts to have a light pollution by-law apply only to privately-owned property, one of the best responses should members of the public object, is to confirm that a municipally-owned and operated facilities are regulated by corporate policies that require energy-efficient and by-law compliant lamps and fixtures. Where the standards for lighting on public lands are more onerous that those imposed by by-law on private lands, the municipality will be able to lead by example.

D. Partnerships and Incentives

The electrical blackout of August, 2003 brought sharply into focus the need to conserve energy. One of the greatest concerns of government is that individuals will soon forget the necessity for

conservation. A light pollution by-law may, where compliance is high, effect some energy conservation when energy-efficient lamps or bulbs are used and light use is reduced through timers or hours of operation. As such, it may be possible for a municipality to coordinate incentive programs with governments or light manufacturers and distributors to encourage the use of energy-efficient lamps and fixtures by members of the public. For example, in Ontario, there is a retail sales tax rebate program in place to allow customers to obtain rebates when purchasing certain new energy-efficient electrical household appliances. While Ontario municipalities must bear in mind the anti-bonusing provisions of the *Municipal Act, 2001* in any undertaking with commercial businesses, there may be opportunities to partner with manufacturers or distributors to make generic light shields available at reduced costs to members of the public who are anxious to comply with a light pollution by-law. Municipal economic development and communications staff perhaps could be of assistance in this area. One of the most persuasive incentives is the savings property owners will see with reduced energy consumption. Examples of actual savings will speak for themselves and should be part of the municipality's communications plan.

Light Pollution By-laws: Good or Bad?

It would be difficult to find anyone who might take exception to the objectives of a light pollution by-law set out above. However, there are detractors of such regulation. Some of the criticism is a result of concerns that lower wattage bulbs and shielded light fixtures will cause safety hazards for vehicles and pedestrians. Others object to the additional costs that are related to the purchasing of light shields etc. in order to be compliant with a light pollution by-law.

Some of these concerns may be assuaged to a certain extent by a comprehensive and informative communications plan as noted above. There is some comfort to be taken from the fact that there are a range of options that municipal councils might use to reduce light pollution and energy consumption, some of which are easier to "sell" to the electorate than others. What the energy crisis of this past summer has shown, however, is that any energy consumption reduction is good and, when all the lights go out, there are stars to see in the heavens.

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