Turning the Lights Out On Light Pollution:  
Recommendations for the Township of Stone Mills

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Most importantly, thank you to my family and friends both near and far for their support and encouragement.
EXECUTIVE SUMMARY

Of all the pollutions affecting the natural environment, light pollution is likely the most easily remedied. Simple changes in lighting design and installation yield immediate changes in the amount of light spilled into the atmosphere. Yet as urbanization and development have increased, artificial lighting has proliferated without regard for these simple measures. The interference of light pollution from such instances have been shown to impact many aspects of the natural and human environment including wildlife, stargazing, human safety, community character and professional astronomy; in addition to simply wasting energy.

This report explores how light pollution is being managed through the implementation of light pollution abatement by-laws within municipalities in the province of Ontario, Canada. It is a comparative case study of three local bylaws including Mississippi Mills By-Law No. 03-62, Township of Central Manitoulin By-Law No. 2003-16, and the Municipality of Whitestone By-Law No. 16-2006. In particular, these findings will be used to provide recommendations for drafting a light pollution abatement by-law in the Township of Stone Mills where sustainability and protection of the Lennox and Addington County Dark Sky Viewing Area are of utmost importance. Astronomers regard this Township as the most southerly point in Ontario (see Figure 1) where the night sky is still clearly visible.

Figure 1. Location of the Township of Stone Mills, Ontario. (Google Maps)
This report addresses one research question: **What approaches learned from other municipal light pollution abatement by-laws are relevant to implementation in the Township of Stone Mills to effectively manage light pollution?**

In order to answer the research question and to develop recommendations for the Township of Stone Mills, the three municipal by-laws were analyzed and compared to understand the different approaches to designing and implementing light pollution abatement bylaws. The criteria used to evaluate the by-laws was based on a model developed by the Law Reform Commission of Saskatchewan which looked at existing legislation in Canada and the US including: the Royal Astronomical Society of Canada's model by-law, as well as works drafted in New Hampshire (*Proposal for a State of New Hampshire Outdoor Lighting Control Ordinance*), Iowa (*Iowa Standards for Outdoor Lighting*) and Indiana (*Framework for Outdoor Lighting Improvement Ordinances*), among others, to determine a set of common features present in all drafted legislation.

The key by-law components were identified as follows:

1. Intensity Control
2. Shielding Requirements
3. Light Trespass
4. All-Night Lighting
5. Prohibitions
6. Exemptions
7. Penalties/Enforcement

Overall, the majority of the seven by-law categories were apparent within each by-law in some form. From the document analysis, a set of recommendations was derived for the Township of Stone Mills in developing an effective light pollution abatement by-law that best fits the rural character of the community and upholds the intent of such a by-law. The key recommendations of each category are as follows:

- **Intensity Control** - Clear and measurable requirements for intensity based on IESNA recommendations should be prominently included.
• **Shielding Requirements** - Include a visual appendix with examples of acceptable and unacceptable lighting fixtures, and shielding solutions for existing fixtures.

• **Light Trespass** - Keep language at a high level, but include language that highlights the impacts of light trespass to raise awareness of the issue.

• **All-Night Lighting** - Restrict outdoor lighting other than security lighting between 11pm and sunrise.

• **Prohibitions** - Consider developing a special set of considerations for the area around the Lennox and Addington County Dark Sky Viewing Area.

• **Exceptions** - Keep exceptions high level and minimal. Examples of common exceptions include: low intensity lighting, sports facilities (when not in use) and airport or other navigational lighting.

• **Penalties/Enforcement** - Utilize a citizen-friendly approach to regulation; such an approach may make municipal staff available to assist in working with the violator to address the issue or provide extra time for compliance if warranted.

Although these recommendations provide a starting point for developing a light pollution abatement by-law in Stone Mills, further research would enable the development of an all encompassing strategy. In addition to conducting interviews and looking at a wider variation of case studies, other topics that warrant additional research include: local regulation versus a provincial/national approach to light pollution; alternative solutions to addressing light pollution; evaluating enforcement versus advocacy and education programs; and challenges in addressing light pollution in rural versus urban settings.

The Township of Stone Mills is in an excellent position to create a light pollution abatement by-law that protects the health and integrity of the area’s night sky, because the Township is home to the County’s Dark Sky Viewing Area and has a keen interest in sustainability. Applying these recommendations is an important next step to ensuring that the community continues to move towards achieving a sustainable night environment for future generations.
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CHAPTER 1: INTRODUCTION

Topic Overview
Light pollution has been described by researchers as “one of the most rapidly increasing alterations to the natural environment” (Cinzano et al., 2001). As urbanization and development have exploded in Canada, demand has required the artificial lighting of everything from roadways to shopping centres to homes (Navara & Nelson, 2007). The interference of light pollution from such sources has been shown to impact many aspects of the natural and human environment including wildlife, stargazing, human safety, community character and professional astronomy; in addition to simply wasting energy (IEA, 2006; Gallaway et al, 2009). Accordingly, there is opportunity for municipalities and local planners to implement policy to regulate light pollution just as one would any other kind of pollution.

A handful of municipalities in Canada have already taken steps to manage and reduce light pollution in their communities. These actions range from local policies to comprehensive light pollution abatement by-laws. While these communities lead the way, other communities could also benefit from these practices. One such instance is the Township of Stone Mills. The Eastern Ontario Township is considered by astronomers to be the most southerly point in Ontario where the night sky can still be observed without interference from city lights. As such, protecting this unique scenic resource is essential to ensure that the night sky remains visible and accessible for future generations.

This report is intended to help inform policy options for implementing a light pollution abatement by-law in the Township of Stone Mills by looking at what has previously been done in three other Ontario municipalities which have already incorporated such by-laws into their planning tools. By reviewing these by-laws, this report will build an inventory of the implementation options and best practices, which could be used by the Township of Stone Mills to develop an effective light pollution abatement by-law.
Research Question
What approaches learned from other municipal light pollution abatement by-laws are relevant to implementation in the Township of Stone Mills to effectively manage light pollution?

Background
In the last hundred years, light pollution has become a widespread issue and in many places across Canada, the night sky is being reduced to a fuzzy glow. However, light pollution is an issue that for the most part has been neglected, despite its’ growing presence (Gallaway et al, 2009). A general definition for the term light pollution is the presence of excessive or obtrusive artificial light from man-made sources caused by bad lighting design (Gallaway et al, 2009). The International Dark Sky Association suggests that light pollution comes in three common forms: glare, light trespass, and sky glow (2013). The first component, glare, is light that shines horizontally across an area with excessive brightness that causes visual discomfort. Light pollution in the form of light trespass includes light falling where it is not intended, wanted or needed. Lastly, the glare from unshielded fixtures also scatters off dust particles and aerosols above the ground to illuminate the air above the site, causing a brightening of the night sky. This is seen as artificial sky glow, the final component of light pollution.

Over time, public and private spaces have been trending towards the use of unnecessary lighting and higher wattage bulbs (Mizon, 2012). These factors, in combination with population growth and development, have caused the growth rate of light pollution to accelerate. Without efforts to manage this trend, the Milky Way and the natural darkness of our night sky will disappear.

Effects of Light Pollution
In many ways, light pollution is similar to other pollutants and environmental problems that have been carefully studied (Baumol, and Oates, 1971; Wirl, 2007; Sobotta et al., 2007; Picao-Tadeo and Reig-Martinez, 2007; Shimshack et al., 2007). Like these other pollutants
and environmental problems, light pollution can interfere with the human and natural environment; with effects that are far more common, widespread and serious than commonly realized (Gallaway et al., 2009).

**Wasted Energy**

Light that illuminates the sky contributes to increased carbon dioxide emissions and ultimately global warming (Gallaway et al., 2009). Outdoor lighting is being installed that is too bright for its intended purpose and that is shining into places where its emissions are not needed (Mizon, 2012). Such practices see as much as 30% of the light wasted (California Energy Commission, 2006). Better lighting practices result in more efficient lighting, requiring less energy as an input. When less energy is necessary, this means less pollution is generated in producing the power required. It is estimated that eliminating light pollution would be the CO2 equivalent of removing over 9.5 million cars from the road (Environmental Protection Agency, 2006; Department of Transportation, 2001).

**Human Health and Safety**

More research is linking exposure to artificial light to human health problems but there does not appear to be a consensus on the matter. However, researchers agree that if nothing else, light pollution disrupts the world in which human bodies are adapted (Navara & Nelson, 2007, Gallaway et al., 2009). One indisputable aspect of health and safety is that excessive lighting can significantly reduce the night vision of drivers thereby creating a hazard to both drivers and pedestrians (Mizon, 2012). People have been struck and killed by drivers who have been blinded by the glare from security lighting and other light sources. Accordingly, lighting regulations can help make roads and sidewalks safer for all users.

**Wildlife**

The impacts of light pollution are also felt in the ecological world (Longcore & Rich, 2004; Gaston et al., 2012). The light/dark cycle regulates many physiological and behavioural processes for wildlife and the natural environment as a whole; as such, the impacts from
artificial lighting may alter reproductive activities, predator/prey interactions, orientation capabilities and even species survival (Navara & Nelson, 2007; Mizon, 2012; Gallaway et al., 2010). As such, protecting the darkness of the night is an important early step to enabling conservation of animal habitat.

_Rural Character_

Although generally taken for granted, the night sky is in fact a unique scenic resource (Gallaway et al., 2009)). In 2001, a study estimated that 66% of the American population and 50% of the European population could no longer see the Milky Way at night (Cinzano et al., 2001). This number has continued to grow over time and it is alarming to consider that something so important to art, science and culture is no longer visible to the majority of people living in developed countries. As light pollution encroaches on rural areas known for their dark skies, the rural character of the area is being lost. The aesthetic damages affect both residents and visitors to the area, and reduce the willingness of individuals to move to and or visit the area (Gallaway et al., 2009).

_Professional and Amateur Astronomy_

Light pollution interferes with both professional and amateur astronomy by reducing the visibility of galaxies, nebulae and other celestial objects (Riegel, 1973; Heilig, 2010). On a larger scale, this interrupts the ability for professionals to conduct research and contribute to scientific advancement. While at the more local level, light pollution detracts from the first-time experience of looking to the sky with a telescope; hampering inspiration to pursue astronomy further, whether it is as a hobby or professionally.

_Challenges of Light Pollution_

Light pollution is perhaps the most easily remedied of all the pollutions we face (Croil, 2009). Simple changes in lighting design and installation yield immediate changes in the amount of light spilled into the atmosphere and immediate energy savings. So why has light pollution been forgotten while other pollutants have inspired action?
Firstly, it is difficult to view excessive artificial light as a form of pollution because other than being unwanted, light as a pollutant is no different than light as a good (Gallaway et al., 2009). Unlike other forms of pollution, light pollution does not have identifiable negative externalities like gas or coal where the benefits can easily be distinguished between the services provided and undesirable byproducts created. Gallaway instead likens light pollution to non-point pollutants such as fertilizers or pesticides. In these cases, the good becomes a pollutant when it affects something other than the intended purpose; in instances where fertilizer increases crop yield, it is seen as good whereas when the runoff pollutes a stream, it is seen as a pollutant. As such, light that improves visibility for humans is a good; however when lighting causes glare or deepens shadows or washes out the stars, this reduces visibility and is accordingly a pollutant (Gallaway et al, 2010).

The second issue identified by Gallaway et al is that light pollution has characteristics of a local, regional and a global externality (2010). In instances where light causes nuisance problems, it is considered a local issue such as being bothered by light from a park or car lot. In contrast, skyglow created from the City of Vancouver might be characterized as a regional issue because it affects all of metro Vancouver and washes out the night sky up the valley. To view light pollution as a global problem, one can look at the example of light pollution impacting migratory bird patterns or astronomical research. How light pollution is viewed affects how it is dealt with (Gallaway et al, 2010). Local problems are easier to address and can be resolved through lighting ordinances etc. but on a larger scale, there is no unified approach to dealing with light pollution yet.

Light Pollution and The Township of Stone Mills
The Township of Stone Mills is located east of Greater Napanee in Lennox and Addington County, Ontario, Canada. The Township is primarily an agricultural community but is also known for its natural environmental splendor. According to the 2011 Canadian Census, the Township has a population of 7,560 people. There are five main communities, Centreville, Croydon, Erinsville, Newburgh and Tamworth, and a number of smaller hamlets and settlement areas throughout the Township. The Township is characterized by rural
residential living, with a handful of commercial and recreational features located within the larger communities.

The community is committed to environmental stewardship and supports conservation, environmental protection and green energy in the area (County of Lennox & Addington, 2014). Leadership from the community has been shown through the creation of the Tamworth/Erinsville Community Development Committee. This non-governmental volunteer-led community organization strives to improve and preserve the rural community and even includes a green committee, which is working to enhance the quality of life in the area through environmental projects (Meek, 2009). The location of the Township within Ontario is shown below in Figure 1.1.

![Figure 1.1. Location of the Township of Stone Mills, Ontario. (Google Maps)](image)

Astronomers regard the Township of Stone Mills as the most southerly point in Ontario where the night sky is still clearly visible (County of Lennox & Addington, 2014). As such, it is home to the Lennox & Addington County Dark Sky Viewing Area, a site ideal for both professional and amateur astronomers. The Viewing Area includes a large concrete pad for telescope set up, or for placement of chairs for stargazing. However, with the population and development growing in the area, the Township is at risk of losing its’ pristine night
sky. This would mean the loss of a unique resource for the area, but would also impact the rural character that Stone Mills is known for. Given its commitment to sustainability and green initiatives, the Township of Stone Mills is an excellent candidate for implementing a light pollution abatement by-law; such measures will help to ensure that the night sky remains visible in the community for future generations.

Report Outline
This report is organized into four chapters:

Chapter 1 provides an introduction to the report and the topic of light pollution. It defines light pollution, describes the impacts of light pollution, and outlines the challenges of regulating light pollution.

Chapter 2 outlines the research methods used for this report and introduces the analysis criteria and three case studies.

Chapter 3 presents the detailed analysis of the three Ontario light pollution abatement by-laws through the application of the analysis criteria outlined in Chapter 2.

Chapter 4 concludes the report and provides recommendations and conclusions for implementing a light pollution abatement by-law in the Township of Stone Mills.
CHAPTER 2: RESEARCH METHOD

Research Method
The qualitative method used to answer the research question was the case study method. The case study method was selected because it tries to understand the specifics of each case, including the process, that lead to the adoption of particular policies (Yin, 2009). For this report, a comparative case study structure was employed to compare alternative approaches to regulating light pollution at the municipal level (Yin, 2009). As per a comparative case study structure, the entire case study was repeated, in this case three times (Yin, 2009). The selected case studies were used to provide the Township of Stone Mills with lessons on lighting regulations and to provide recommendations for implementing their own light pollution abatement by-law. This design, looking at multiple case studies, enables analytical conclusions that are more powerful than those developed from a single case (Yin, 2009). Additionally, the use of multiple case studies helps to build data triangulation through the multiple case studies themselves (Yin, 2009).

The research method for this report has been designed based on a Queen’s University School of Urban and Regional Planning Master’s report completed by Anna Froehlich (2012). The report examines the different approaches to natural heritage systems planning taken by the City of Kingston, the Waterloo Region and the Oak Ridges Moraine. For her report, Froehlich developed a set of criteria based on several criteria frameworks to evaluate the different policy options to implement natural heritage systems planning. The findings were then used to provide Prince Edward County with recommendations and policy options for implementing natural heritage systems planning. The method employed by Froehlich is appropriate for this report as a means of evaluating the implementation of policies and controls to reduce light pollution based on observable criteria.

Case Studies
Three light pollution abatement by-laws in Ontario were selected as case studies to be evaluated. Case studies were selected based on the presence of a light pollution abatement
by-law. While several municipalities in Canada have development standards and policies that address lighting, there are few that have gone so far as to implement light pollution abatement by-laws; at least five municipalities in Canada have outdoor lighting by-laws currently in place. These municipalities include: Richmond Hill, Ontario, Saanich, British Columbia, Mississippi Mills, Ontario, Manitoulin Township, Ontario and the Municipality of Whitestone, Ontario.

These municipalities have enacted bylaws in order to protect observatories, Dark Sky Preserves, or the rural character of the area. The observatories that have benefited from these by-laws include: David Dunlap Observatory in Richmond Hill, the Dominion Astrophysical Observatory in Saanich, and the Fred Lossing Observatory in Mississippi Mills. In the Township of Central Manitoulin, the by-law was established to protect Gordon’s Park Dark Sky Preserve while the municipality of Whitestone, implemented a light pollution by-law to protect the rural tranquility of the lake area. The following table summarizes the five highlighted municipalities:

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Population</th>
<th>Area</th>
<th>Regulation</th>
<th>Observatory/DSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mississippi Mills, ON</td>
<td>12,385 (2011)</td>
<td>520 km²</td>
<td>BY-LAW #03 – 62 (2003)</td>
<td>Fred Lossing Observatory</td>
</tr>
<tr>
<td>Township of Central Manitoulin, ON</td>
<td>1,958 (2011)</td>
<td>432 km²</td>
<td>BY-LAW #2003-16 (2003)</td>
<td>Gordon's Park Dark Sky Preserve</td>
</tr>
<tr>
<td>Municipality of Whitestone, ON</td>
<td>918 (2011)</td>
<td>958 km²</td>
<td>BY-LAW #16-2006 (2006)</td>
<td>N/A</td>
</tr>
<tr>
<td>Richmond Hill, ON</td>
<td>185,541 (2011)</td>
<td>101 km²</td>
<td>Chapter 1050 – LIGHT POLLUTION</td>
<td>David Dunlap Observatory</td>
</tr>
<tr>
<td>Saanich, BC</td>
<td>109,752 (2011)</td>
<td>103 km²</td>
<td>SCHEDULE “B” TO ZONING BYLAW 8200</td>
<td>Dominion Astrophysical Observatory</td>
</tr>
<tr>
<td>Township of Stone Mills, ON</td>
<td>7,560 (2011)</td>
<td>709 km²</td>
<td>N/A</td>
<td>L&amp;A Dark Sky Viewing Area</td>
</tr>
</tbody>
</table>

Given these five municipalities, three were selected for comparison, including: Mississippi Mills, the Township of Central Manitoulin, and the Municipality of Whitestone. These three
municipalities were selected for comparison because they are all located within the same province (See Figure 2.1 below) and fall under the same provincial policy. Additionally, the cases selected represent municipalities of similar size, area and ultimately likeness, while keeping the number of cases manageable. Moreover, the Township of Stone Mills seeks to protect the L&A Dark Sky Viewing Area and the rural atmosphere, ensuring compatibility with the aforementioned cases. Richmond Hill was not selected as a case study as it is a rapidly growing suburban municipality in the Greater Toronto Area, with 20 times the population of Stone Mills and therefore is not comparable.

![Map of selected municipalities](image)

**Figure 2.1. Locations of the Three Selected Case Studies**

<table>
<thead>
<tr>
<th>Case Study #</th>
<th>Municipality</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Study 1</td>
<td>Mississippi Mills, ON</td>
<td>BY-LAW #03 – 62</td>
</tr>
<tr>
<td>Case Study 2</td>
<td>Township of Central Manitoulin, ON</td>
<td>BY-LAW #2003-16</td>
</tr>
<tr>
<td>Case Study 3</td>
<td>Municipality of Whitestone, ON</td>
<td>BY-LAW #16-2006</td>
</tr>
</tbody>
</table>

**Table 2.2. Summary of the Three Selected By-laws**

**Data Analysis**

The three municipal by-laws (see Table 2.2) were analyzed and compared to understand the different approaches from three Ontario jurisdictions to design and implement light pollution abatement bylaws. The criteria used to evaluate the by-laws was based on a
model developed by the Law Reform Commission of Saskatchewan that suggests light abatement control should address the following topics: intensity control, shielding requirements, light trespass, all-night lighting, prohibitions, exemptions, and penalties (2007). This model looked at existing legislation in Canada and the US including: the Royal Astronomical Society of Canada’s model by-law, a well as works drafted in New Hampshire (*Proposal for a State of New Hampshire Outdoor Lighting Control Ordinance*), Iowa (*Iowa Standards for Outdoor Lighting*) and Indiana (*Framework for Outdoor Lighting Improvement Ordinances*), among others, to determine a set of common features present in all drafted legislation (Law Reform Commission of Saskatchewan, 2007).

Each municipal by-law was analyzed for how it addresses each of the seven features. The criteria ensure consistency in the analysis of each bylaw. The results of the analysis were then reviewed to consider what content would be most appropriate in the Township of Stone Mills for an effective light pollution abatement control bylaw.

Each by-law was reviewed with consideration for how the following criteria are addressed with particular consideration to the questions outlined below each topic.

1. **Intensity Control**

As stated in the Iowa Standards for Outdoor Lighting bill, “excessive light levels are unnecessary and wasteful and often result in light which is obtrusive, causing glare, light trespass, and uplight” (Law Reform Commission, 2007). Intensity regulation may include restrictions on light levels for different types of lighting or specifications for maximum intensity per parcel of developed land (lumens per acre). Recommendations for acceptable light intensity levels can be found from different organizations, such as the Illuminating Engineering Society of North America (IENSA).

For each case study, the by-laws were examined to answer the following questions:

- How is intensity control dealt with in the by-law?
- What method is used to measure light intensity?
2. Shielding Requirements

Simple changes to lighting design can help minimize glare, light trespass and skyglow by directing light downward (Royal Astronomical Society of Canada, 2013). Shielded lighting fixtures, called “full cut off” fixtures, direct light downwards and eliminate the upward transmission of light (Dark Sky Society, 2009). Although shielded fixtures are preferable, some types of lighting may not require full-cut-off fixtures due to their lower intensity or pre-existing status; examples include: existing lighting, door lights and other low intensity residential lighting, and illuminated signs (Law Reform Commission, 2007). The Law Reform Commission also recommends that shielding requirements for illuminated signs should be addressed in greater detail within the zoning bylaws.

For each case study, the by-laws were examined to answer the following questions:

• How are shielding requirements defined?
• What exclusions are made to shielding requirements?
• What references are made to detailed regulation within the ZBL?

3. Light Trespass

Light Trespass is defined as misdirected light that invades neighbouring property (Royal Astronomical Society, 2013). The issue of light trespass should be identified and directly addressed within a by-law (Law Reform Commission, 2007). One way to measure and regulate light trespass is through restrictions on horizontal and vertical foot candles, measured at some distance on the property line; however, intensity and shielding requirements may effectively eliminate light trespass (Law Reform Commission, 2007).

For each case study, the by-laws were examined to answer the following questions:

• Does the by-law address light trespass directly?
• Is light trespass eliminated through intensity and shielding requirements?
4. All Night Lighting

This category refers to lighting that is left on all-night long that is not required for security of business purposes. Lighting that falls within this category is one of the most wasteful lighting practices (Law Reform Commission, 2007). The Law Reform Commission concludes that the greater the detail in regulating all-night lighting, the more effective; at a minimum it is important to identify the time after closing that lights must be turned off at and the rules for lighting empty parking lots (Law Reform Commission, 2007).

For each case study, the by-laws were examined to answer the following questions:

• In what detail does the by-law address all night lighting?
• How is all night lighting restricted?

5. Prohibitions

Some forms of lighting, such as searchlights and outdoor strobe lights, should be explicitly prohibited (Law Reform Commission, 2007). These forms of lighting are non-essential for public safety purposes and are considered noxious sources of light pollution.

For each case study, the by-laws were examined to answer the following questions:

• What forms of lighting are prohibited within the by-law?

6. Exceptions

Some exceptions to lighting regulations may be deemed appropriate. This may include common items such as existing lighting, low intensity lighting, sports facilities (when not in use), and airports (Law Reform Commission, 2007).

For each case study, the by-laws were examined to answer the following questions:

• What lighting is exempt from regulation?
• How appropriate are the exceptions identified?
7. Penalties/Enforcement

In order for the light abatement bylaw to be effective, there must be opportunity for monitoring and enforcement (Law Reform Commission, 2007). The public must be made aware as to what the process is and what the penalties are for violating the by-law.

For each case study, the by-laws were examined to answer the following questions:

- How is the by-law enforced?
- Are there penalties explicitly stated?
- Is there a monitoring/review framework in place?
- Who is responsible?

Limitations

Several limitations exist in this research as a result of time constraints. The researcher selected three Ontario case studies for comparison; looking at more case studies would produce more powerful conclusions. Additionally, as light pollution abatement by-laws are relatively new legislation in Canada, looking to countries outside of North America could offer innovative and new approaches while building triangulation. Secondly, this report looks at light pollution abatement at the municipal level while a regional or provincial approach to reducing light pollution should also be considered. Lastly, regulation of light pollution represents only one approach to reducing light pollution. With more time, greater investigation into the role of advocacy and education would provide more robust recommendations.

Limitations are also present in terms of measuring the effectiveness of by-laws. Light pollution is difficult to measure and simple methods are not readily available to do so. Therefore, challenges exist for researchers in determining the usefulness of regulation.

The researcher holds a bias in support of light pollution abatement initiatives. Available information may have been limited and lack a fully accurate representation of light pollution strategies.
CHAPTER 3: DATA ANALYSIS

Introduction

This chapter presents an analysis of the light pollution abatement by-laws developed by Mississippi Mills (see Appendix A), the Municipality of Whitestone (see Appendix B), and the Township of Central Manitoulin (see Appendix C). Each by-law was examined based on the criteria and questions outlined in the methods chapter. As such, consideration was given to the following by-law components: intensity control; shielding requirements; light trespass; all night lighting; prohibitions; exceptions; and penalties/enforcement.

The analysis of the by-laws is presented by each identified component. Each section begins with a summary table, which is followed by the analysis of each municipality, and concludes with a brief discussion on some of the strengths and weaknesses of each by-law as well as the implications for Stone Mills.
Intensity Control

<table>
<thead>
<tr>
<th>Mississippi Mills</th>
<th>Whitestone</th>
<th>Central Manitoulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity control is based on IESNA recommendations. The by-law speaks to uniform light levels in the urban areas, safety lighting, and provides recommended values for average surface illumination and uniformity ratios in Table I Appendix I. The lamp wattage design requirement for both new and grandfathered street lighting are also identified.</td>
<td>Intensity control is not formally addressed in its own section of the by-law. Restrictions on lumens per acre are only outlined for unshielded lights in Note 2 under Section 11.16. The only other restrictions on intensity are limited to wattage maximums for specific lighting types contained in various sections indiscriminately.</td>
<td>Intensity Control is not addressed in the by-law.</td>
</tr>
</tbody>
</table>

**Mississippi Mills**

Mississippi Mills By-law No. 03-62 addresses intensity control in two subsections of the by-law, which follow the recommendations of the Illuminating Engineering Society of North America (IESNA). Within Section 2.2.1 it states, the town strives for “uniform light levels within the urban area that do not exceed uniformity ratios recommended by the IESNA” and “minimum light used for safety the does not exceed IESNA recommendations”. The recommended values for illumination and uniformity ratios are identified in Table I of Appendix A. Within the Appendix, specifications are outlined for types of roadway lighting and types of public spaces lighting for both luminance, measured in foot candles (fc), and uniformity ratios. The recommendations do not cover every potential land use but do serve as a guideline for new development based on usage levels.

Design requirements for street lighting are identified in Section 2.3. Here lamp wattage design requirements are outlined for: residential, intersections, and major thoroughfares. Furthermore, pole spacing ratios are also identified. Both of these street light design requirements apply to new and grandfathered street lighting.
**The Municipality of Whitestone**

Intensity control is not addressed in detail within the Whitestone by-law. Restrictions on lumens per acre are only outlined for unshielded lights; “unshielded lights (all types) are limited to a maximum of 5,500 lumens per net acre.” Additionally, “residential parcels, and development projects containing one net acre or less are allowed 5,500 lumens of unshielded light (all classes)”. These restrictions are outlined within Note 2 under Lamp Type and Shielding Requirements contained within Section 11.16, which makes them seem insignificant.

Other restrictions on intensity are limited to wattage maximums for specific lighting types. For example, “spot and floodlighting of walkways driveways, yards and buildings are limited to a maximum of two fixtures of no more than 150W each... (14.1)” while lighting for docks and boathouses is limited to “no greater illumination than 40W per fixture (16.1).”

**The Township of Central Manitoulin**

The Township of Central Manitoulin does not address intensity control in its Outdoor Lighting Control and Dark Sky By-law.

**Strengths and Weaknesses**

The Township of Central Manitoulin does not address intensity control, so only two of the by-laws speak directly to intensity control. The controls within the Whitestone by-law are minimal and do not offer a comprehensive or organized approach to regulating lighting intensity. On the contrary, Mississippi Mills has established quite effective intensity control measures. The intensity control restrictions are based on IESNA recommendations, providing a standardized form of measurement; included in the Appendix are recommended foot-candles and uniformity ratios, which are specific and measurable for each type of use. Additionally, wattage recommendations and pole spacing ratios are listed for street lighting showing focus and leadership from the municipality while ensuring safety.
**Implications for the Township of Stone Mills**

The approach from Mississippi Mills may be the most appropriate for the Township of Stone Mills because it follows IESNA standards and provides recommended foot-candles and uniformity ratios for uses that are applicable in the Township.
Shielding Requirements

<table>
<thead>
<tr>
<th>Shielding Requirements Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mississippi Mills</strong></td>
</tr>
<tr>
<td>“Any person installing an outdoor lighting fixture shall be required to use completely shielded Full Cut-Off fixtures, as identified in Appendix I, attached hereto and forming part of this by-law (2.2).”</td>
</tr>
</tbody>
</table>

**Mississippi Mills**

Mississippi Mills By-law No. 03-62 begins by outlining shielding requirements at the beginning of the lighting regulations (Section 2), signifying their importance. The by-law first speaks to outdoor lighting generally, stating “any person installing an outdoor lighting fixture shall be required to use completely shielded Full-Cut-Off fixtures, as identified in Appendix I (2.2)”; a detailed list of what is considered outdoor lighting follows (i.e. lights for: buildings and structures, parking lot lighting, rural barn lights etc.). In addition to the general all encompassing specification, Full-Cut-Off fixtures are also identified in additional sections as needed for: municipal streetlights and residential areas, street lighting, structural illumination, and recreational facilities.

The Mississippi Mills by-law includes a detailed Appendix defining Full or Sharp Cut Off, Examples of Acceptable/Unacceptable Lighting Fixtures, Shielding Solutions for Existing Fixtures. The included definition of Full Cut Off and examples of lighting fixtures follow the recommendations of the IESNA, while the shielding solution is from Kanata, Ontario. It should be noted that the detailed regulation of outdoor advertising signs is left to the Town’s Sign By-law No. 02-98 Section 5.2.
The Municipality of Whitestone

Shielding requirements are covered within numerous sections of the Whitestone by-law. The primary source of requirements is found in Section 9. Here it states, “Except as provided in Subsection 9.2, no person shall erect, install, or use an outdoor light fixture which is not shielded.” As mentioned the subsections identify the exempted fixtures, which include but are not limited to fixtures in connection with recreational activities, commercials, or tube lighting etc. The shielding requirements listed in Section 9 also specify, “that fixtures must be of a design that allows the direction of light projection to be modified after installation.”

Further requirements are included under Section 11, Prohibitions. Here it states, “all light fixtures which are required to be shielded shall be installed in such a manner that the shielding complies with the definition of fully shielded fixtures (11.2).” The definition of fully shielded is consistent with IESNA’s definition but not as specific. Attention is also given to recreational facilities where fully shielded fixtures are not utilized. In these cases, acceptable luminaries require “internal or external glare control louvers” or “aiming angles that permit no greater than 2% of light emitted to project above the horizontal” (11.10). Lighting for outdoor display lots, externally illuminated signs, outdoor neon lighting, Class 1, 2, and 3 lighting above 2050 lumens, neon tube lighting, are also required to be fully shielded. Class 1, 2 and 3 lighting and other types below 2050 lumens, and lamps in motion sensing security lights are permitted to be unshielded.

Special mention is made in the by-law regarding light fixtures adjacent to residential properties, architectural and landscape lighting, pathway, dock, and boathouse lighting, all of the above-mentioned lighting require shielding whether it be through fixtures or design.

The Township of Central Manitoulin

Like Mississippi Mills, the Central Manitoulin by-law prioritizes shielding requirements by addressing them within the first subsection of Application, emphasizing their importance. The by-law states that “All outdoor lighting fixtures shall be fully shielded and be of the full
cut-off type of fixture (4.1).” Although the most basic, the requirements are clear and effective, and apply to all outdoor lighting fixtures within the municipality. Definitions are provided for the terms “Fully Shielded” and “Full Cut-Off Fixtures” which follow standard definitions as per IESNA. In reference to Full Cut-Off Fixtures, the definition refers to Appendix A that presumably provides examples of such fixtures, but the Appendix is not included in the by-law and could not be found.

**Strengths and Weaknesses**
Attention to shielding requirements is given in all three municipal by-laws with varying degrees of detail. The Mississippi Mills by-law is most comprehensive and clear, given its adherence and reference to IESNA standards and included visual appendix. Cleverly, it leaves detailed regulation of outdoor advertising signs to the municipality's sign by-law. The Township of Central Manitoulin's by-law provides only a broad over-arching statement on all outdoor lighting. Its definitions are consistent with IESNA standards, but would benefit from following IESNA recommendations. Both Mississippi Mills and Central Manitoulin include shielding requirements at the beginning of the by-law, signifying the importance and relevance of the requirements. Whitestone's by-law relies heavily on the reader to go through the entire by-law to determine what is applicable. Although largely contained to one section, exceptions and variations are offered throughout which address specific types of lighting.

**Implications for the Township of Stone Mills**
The approach from Mississippi Mills may be the most appropriate for the Township of Stone Mills because it covers all fixtures and a visual appendix is provided to assist residents in selecting appropriate fixtures or design solutions.
Light Trespass

<table>
<thead>
<tr>
<th>Light Trespass Summary</th>
<th>Mississippi Mills</th>
<th>Whitestone</th>
<th>Central Manitoulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires fixtures to be shielded “so as to eliminate light trespass (2.5).” An Outdoor Illumination Committee has been established to assist residents in correcting light trespass issues. An example of a shielding solution is provided in Appendix I.</td>
<td>Requires fixtures to be shielded “so that the direct illumination shall be confined to the property boundary of the source (11.2).” Further references to light trespass are made with regards to fixture type and mounting, as well as sporting facilities.</td>
<td>Requires fixtures to be shielded so that light does not spill over and “interfere with the peaceful enjoyment of residential of public properties (4.2).”</td>
<td></td>
</tr>
</tbody>
</table>

**Mississippi Mills**

Mississippi Mills By-law No. 03-62 speaks directly to light trespass in Property Illumination (2.5) and Provisions for Shielding Exterior Lighting to Reduce Light Trespass (2.6). Section 2.5 states “all artificial lighting for yards and parking areas shall be arranged so as to eliminate light trespass. Light trespass may be reported to the Mississippi Mills Outdoor Illumination Committee for problem resolution.” Section 2.6 offers support to residents to obtain advice from the Outdoor Illumination Committee on proper shielding to prevent light trespass. Suggestions are contained within Appendix A that includes examples of acceptable fixtures and shielding solutions for existing fixtures.

**The Municipality of Whitestone**

In the Municipality of Whitestone’s by-law, it requires that “all light fixtures… shall be aimed or shielded so that the direct illumination shall be confined to the property boundaries of the source (11.2).” Light trespass is also addressed in Section 14 Fixture Type and Mounting, within the sub category “shielding”. Here it states “where light fixtures are adjacent to residential properties, lighting fixtures shall by use of fixture cutoffs and/or use of optically controlled fixtures to eliminate light spillover and glare or directional aiming so as not to trespass beyond the 5 metre set back from property lines, except as elsewhere permitted in this Bylaw (14.4).” Light trespass is also mentioned with regards to
professional level sports facilities where fully shielded fixtures are not utilized. In this case, acceptable luminaries shall be “installed so as to minimize upward shining light and offsite light trespass as required (11.10.a).”

The Township of Central Manitoulin

Light trespass is addressed in Section 4.2 which states that “lighting fixtures shall be shielded and/or directed in such a manner that they illuminate only the area intended and do not spill over into neighbouring areas so as to interfere with the peaceful enjoyment of residential or public properties.”

Strengths and Weaknesses

The issue of light trespass is identified and directly addressed in all three municipal by-laws in a relatively broad sense. None of the by-laws place restrictions on light emitted. Instead these restrictions are contained within intensity and shielding requirements, which ultimately help reduce light trespass. Mississippi Mills takes a user-friendly approach, outlining that advice and assistance on preventing light trespass are available through the municipality. The municipality has even gone so far as to establish an Outdoor Illumination Committee for the community to provide information, and assist in problem solving as well as regulation. The wording of the Central Manitoulin by-law provides the greatest clarity on the impacts of light trespass, thereby educating the public and highlighting the importance of eliminating light trespass.

Implications for the Township of Stone Mills

An approach like Mississippi Mills that sees the establishment of a committee may be the most fitting for Stone Mills because a committee would offer the greatest benefit to the community. Committees focusing on improving the rural character of the Township have proven to be successful at carrying-out projects (Tamworth Erinsville Community Development Committee) and there may be opportunity for collaboration with these pre-existing groups.
All-Night Lighting

<table>
<thead>
<tr>
<th>Mississippi Mills</th>
<th>Whitestone</th>
<th>Central Manitoulin</th>
</tr>
</thead>
</table>
| There are no references to all-night lighting in the Mississippi Mills by-law. | The following time restrictions apply in the Municipality of Whitestone:  
- Class 1: 10:00pm  
- Class 2: N/A  
- Class 3: 10:00pm  
- Multi-Class: 10:00pm (11.6-11.10)  
- Advertising: 10:00pm or at Business Close, whichever is later (11.13-11.15).  
- All Fixtures should be on timers to turn fixtures off between 11:00pm and sunrise (13.1).  
- All Outdoor Lighting should be off between 11:00pm and sunrise (17) | The following time restrictions apply in the Township of Central Manitoulin:  
- Architectural or Decorative: 2300 hours to sunrise (4.4).  
- Outdoor Recreation Facility Lighting: 2300 hours (4.6). |

**Mississippi Mills**

Mississippi Mills By-law No. 03-62 does not specify any time restrictions on outdoor lighting within the municipality. In terms of recreational lighting, the by-law merely states, “a facility's lighting shall be turned off when not in use”.

**Municipality of Whitestone**

All-night lighting restrictions for the Municipality of Whitestone are largely contained within Section 11, Prohibitions. Time restrictions are placed on each class of lighting: Class 1 lighting may operate until 10:00pm or for as long as the area is in active use; Class 2 lighting is not limited by any time restrictions unless specified by council on new projects; Class 3 lighting, except for flagpole lighting, must be extinguished at 10:00pm or when the
business closes, whichever is later; Holiday lighting is permitted all night between November 15 and January 15; and Multi-class lighting, except security lighting, must conform to the time limitations of the strictest class. Each class is defined within the definitions section of the by-law.

The by-law also outlines time restrictions for lighting related to advertising in Section 11. Lighting used for externally illuminated signs (11.13), outdoor internally illuminated advertising signs (11.14), and outdoor neon lighting (11.15) “shall be turned off at 10:00pm or when the business closes, whichever is later”.

For fixtures governed by the by-law, Section 13.1 recommends that outdoor light fixtures should be equipped with an automatic timing device, which turns fixtures off between 11:00pm and sunrise in order to satisfy the requirements of Section 11. Special requirements for boathouse lighting require state that lighting of same” be equipped with a timer set no earlier than 6:00am and no later than 10:00pm or a motion detector (16.2).”

The by-law also has a section, 17, entitled Hours of Operation, which requires that all outdoor light fixtures should be turned off between 11:00pm and sunrise. The following exceptions are noted within Section 17:

a. outdoor light fixtures may remain on to illuminate outdoor areas for security, or safety purposes provided all other requirements of this by-law are met.
b. Where an outdoor recreational use in an outdoor recreational facility continues after 11:00pm, outdoor light fixtures required to be on in connection with that use are permitted, but only while that use continues;
c. Where a concert, play or other entertainment event in a park or on other lands owned by the Municipality and used for public purposes takes place or continues after 11:00pm, outdoor light fixtures required to be on in connection with that event are permitted, but only while the event takes place or continues; and
d. In an area which is used for commercial, industrial, or institutional uses where such uses are carried on after 11:00pm and personnel relevant to such uses are working on the premises, outdoor light fixtures required to be on in connection with such uses are permitted, but only while such uses are carried on.
The Township of Central Manitoulin

The Township's by-law addresses permissible lighting hours in two subsections. Section 4.4 restricts “architectural or decorative lighting” between 2300 hours and sunrise. While Section 4.6 places limitations on outdoor recreation facilities, the by-law requires that such facilities “shall not be illuminated after 2300 hours, except to conclude any recreational or sporting event, or other activity in progress prior to 2300 hours (4.6).”

Strengths and Weaknesses

The three by-laws have taken three very different approaches to all-night lighting. The Mississippi Mills by-law is the weakest. It does not address all-night lighting except to say that recreational lighting should be turned off when not in use. The Municipality of Whitestone is the most detailed by-law but it is complicated and difficult to follow. For example, restrictions are spread out across different sections and it requires you to know what Class your lighting falls into. Some restrictions appear repetitive and contradictory. For example, recreational lighting is addressed in Section 11, and states 10:00pm as the shut-off time. It is addressed again in Section 17, but it states 11:00pm as the shut-off time.

The Central Manitoulin by-law is specific and easy to read. However, it only regulates “architectural and decorative lighting, and recreational lighting. As such, the by-law is not as all encompassing but it does likely regulate the most common causes of all-night lighting.

Implications for the Township of Stone Mills

An approach similar to Central Manitoulin’s may be the most appropriate for the Township of Stone Mills because broad categories will likely be sufficient to regulate all-night lighting given Stone Mills is characterized by rural lands with some residential development and a handful of commercial operations.
Prohibitions

<table>
<thead>
<tr>
<th>Mississippi Mills</th>
<th>Whitestone</th>
<th>Central Manitoulin</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following prohibitions are identified:</td>
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</tr>
<tr>
<td>▪ Laser Source Light (2.9.1)</td>
<td>▪ Search Lights (11.5)</td>
<td>▪ Metal Halide outdoor lighting (4.3)</td>
</tr>
<tr>
<td>▪ Searchlights (2.9.2)</td>
<td>▪ Laser Source Lights (11.5)</td>
<td>▪ Mercury Vapour outdoor lighting (4.3)</td>
</tr>
<tr>
<td>▪ Outdoor Advertising Off-Site Signs (2.9.3)</td>
<td>▪ Strobe or Flashing Lights (11.5)</td>
<td>▪ Quartz outdoor lighting (4.3)</td>
</tr>
<tr>
<td>The following prohibitions apply to the area within 4 kilometres of the Fred Lossing Observatory:</td>
<td>▪ Motion or Illusion Lights or any similar high-intensity light (11.5)</td>
<td>▪ Installation of lights above 9.2 metres (4.5)</td>
</tr>
<tr>
<td>▪ Illuminated Signs</td>
<td>▪ Mercury Vapour (8.1)</td>
<td></td>
</tr>
<tr>
<td>▪ Non-full Cutoff Cobra</td>
<td>▪ Bottom or Side Mounted Outdoor Advertising Sign Lighting (8.2)</td>
<td></td>
</tr>
<tr>
<td>▪ Pole Spacing Ratio &lt;10 (Appendix 1 – Table 2)</td>
<td>▪ Outdoor Flood Lighting by Flood Light Projection above the horizontal (11.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Installation of parking lots lights above 6 metres (12.1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Installation of lights 4.5 metres above grade for residential purposes (12.2)</td>
<td></td>
</tr>
</tbody>
</table>

**Mississippi Mills**

Mississippi Mills By-law No. 03-62 speaks to prohibitions in Section 2.9 and explicitly identifies three types of prohibited lighting. Laser source light, or “any similar high intensity light” is prohibited” for outdoor advertising or entertainment purposes (2.9.1).” Searchlights are also prohibited “for advertising or entertainment purposes (2.9.2).” Lastly, “electrical illumination of outdoor advertising off-site signs along roadways is prohibited after business hours (2.9.3).” Additionally, a separate set of prohibitions is outlined for within four (4) kilometres of the Fred Lossing Observatory. As specified in Appendix 1
Table 2, within a 4 kilometre radius of the Fred Lossing Observatory, illuminated signs, non full-cut off cobra and a pole spacing ratio less than 10 are prohibited.

**Municipality of Whitestone**

Prohibited lighting is identified in various sections of the Whitestone by-law. Within Section 8, Nonconforming Uses, the by-law prohibits mercury vapor lamps for outdoor lighting, as well as bottom or side-mounted outdoor advertising sign lighting.

In Section 11 Prohibitions, “outdoor floodlighting by flood light projection above the horizontal is prohibited. (11.1).” Mercury vapour light fixtures are again prohibited, as well as “search lights, laser source lights, strobe or flashing lights, motion or illusion lights, or any similar high-intensity light” with a caveat “except in emergencies by police and fire personnel (11.5).”

Lastly, the by-law also establishes maximum mounting heights for parking lots and residential lighting. For parking lot lighting, “lighting standards shall be sized in such a manner that the top of the luminary does not exceed 6 metres above adjacent grade (12.1).” Residential standards require that “outdoor light fixtures be limited to a mounting height of 4.5 metres above grade (12.2).”

**The Township of Central Manitoulin**

The Township limits prohibitions to toxic lighting and the maximum height of installed outdoor lighting. In terms of toxic lighting, the by-law states “the use of Metal Halide, Mercury Vapour and Quartz outdoor lighting is prohibited within the boundaries of the Municipality after dark (4.3).” The only other prohibition is that “no lighting shall be installed higher than 9.2 metres” with the exception of recreational field lighting, and streetlights on major roadways “as deemed necessary” (4.5).
**Strengths and Weaknesses**

All three municipalities include different prohibitions that appear to address four different categories: obnoxious advertising/entertainment lighting, toxic types of lighting, outdoor advertising lighting, and height of light fixtures. All such categories are important for inclusion within prohibitions. The prohibitions in the Mississippi Mills by-law are contained to one specific section, which is most user-friendly and clear, whereas the other by-laws contain prohibitions in various sections. Lastly, the Mississippi Mills by-law recognizes that the area around the Fred Lossing Observatory is particularly vulnerable and has developed a specific set of prohibitions that apply to this area. Having a separate set of regulations for such an area will help protect it from future development.

**Implications for the Township of Stone Mills**

A blended approach may be the most appropriate for the Township of Stone Mills in order to protect the Township from both non-essential and noxious sources of light. The approach taken by Mississippi Mills adequately covers non-essential sources of light, while the Municipality of Whitestone and the Township of Central Manitoulin provide examples of restrictions on noxious sources of light.
Exceptions

<table>
<thead>
<tr>
<th>Mississippi Mills</th>
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</tr>
</thead>
<tbody>
<tr>
<td>The following exceptions are identified:</td>
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</tr>
<tr>
<td>▪ Low Wattage lights for decoration purposes (2.4.4)</td>
<td>▪ Fossil fuel fixtures (3.0)</td>
<td>▪ Grandfathered lighting (5.1)</td>
</tr>
<tr>
<td>▪ Temporary exceptions as requested (2.10)</td>
<td>▪ Low wattage lights for decoration purposes (3.0)</td>
<td>▪ Sensor activated lighting (5.2)</td>
</tr>
<tr>
<td>▪ Grandfathered lighting (2.11)</td>
<td>▪ Temporary exceptions as requested (5.0)</td>
<td>▪ Fire &amp; Police emergency lighting as required (5.3)</td>
</tr>
<tr>
<td>▪ No grandfathering in the area 4km around the Fred Lossing Observatory (2.13)</td>
<td>▪ Minor variances as requested (7.0)</td>
<td>▪ Navigational lighting systems (5.4)</td>
</tr>
<tr>
<td></td>
<td>▪ Grandfathered lighting (8.0)</td>
<td>▪ Residential incandescent lamps &lt;100W (5.5.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Decorative outdoor lighting &lt;25W (5.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Solely fossil fuel lighting (5.7)</td>
</tr>
</tbody>
</table>

**Mississippi Mills**

The exceptions within the Mississippi Mills by-law are minimal. The use of low wattage lights for decoration purposes such as Christmas lighting shall be exempt from mounting and design restrictions (2.4.4). Additionally, Mississippi Mills By-law No. 03-62 grandfathers all luminaires and luminous advertising signs lawfully in place prior to the date of passing of the by-law (2.10). However, in the 4km area around Fred Lossing Observatory, “existing luminaries shall be compliant within five (5) years from the date of adoption of this provision and shall not be grandfathered (2.13). Lastly, “any person may submit a written request on a form prepared by the Outdoor Illumination Committee for a temporary exemption to the requirements imposed by this By-law (2.10).”

**Municipality of Whitestone**

Exceptions contained in the Whitestone by-law are many. To begin with, all outdoor fixtures “which produce light directly or indirectly by the combustion of natural gas or
other fossil fuels, such as gas lamps are exempt” and following a complicated description, holiday lighting (i.e. Christmas lights) are also exempt (3.0).

As was the case in Mississippi Mills, a request for a temporary exemption to the requirements imposed by the by-law can be requested for an event that is temporary in nature (5.0). Similarly, any person may apply for a minor variance from the regulation in question (7.0). Lastly, outdoor lighting fixtures are also grandfathered in the municipality (8.3).

Many other minor exemptions are contained within the by-law however these exemptions are related to other criteria such as all-night lighting and shielding requirements etc. As such, these exemptions are not addressed within this criterion because these exceptions do not exempt lighting from regulation entirely.

**The Township of Central Manitoulin**

The Township of Central Manitoulin addresses exceptions in Section 5, Exemptions. The following are exempted from the provisions of the by-law: all luminaries lawfully in places (grandfathered fixtures) (5.1); vehicular lighting and all temporary emergency lighting needed by the Fire and Police department, or other emergency services (5.3); navigational lighting systems at lighthouses and airports (5.4); outdoor lighting fixtures on residential properties with incandescent lamps equal to or less than 100W (5.5); decorative outdoor lighting with bulbs less than 25W (i.e. Christmas lights) (5.6); and outdoor lighting utilizing only fossil fuels (i.e. torches, luminaries, lanterns and open flame devices) (5.7). An additional exception outlined in Section 5, is that sensor activated lighting may be left unshielded if: it doesn’t affect other property, it goes off within five minutes, and it is not triggered by activity off the property (5.2).

Other exceptions covered by other criteria include: outdoor recreational facility lighting extending past 11:00pm (4.6), and the height of streetlights and recreational playing field lighting exceeding the 9.2 metre restriction (4.5).
**Strengths and Weaknesses**

All three municipal by-laws identify exceptions to the by-law, with the major exception in common being the grandfathering of existing lighting. Mississippi Mill’s takes an aggressive stance to protect the area around the Fred Lossing Observatory and does not exempt existing lighting from regulation. Five years were provided for compliance with the by-law of this area. Other common exceptions include low intensity lighting and decorative lighting (i.e. Christmas lights). The Township of Central Manitoulin presents a logical and concise list of exemptions including, in addition to those mentioned, navigational lighting, emergency lighting, recreational lighting, and fossil fuel lighting. Mississippi Mills and Whitestone both include a clause to address temporary exemptions. This provides flexibility and understanding for temporary events. The Municipality of Whitestone does not contain its exceptions to one section and as such, it is difficult to identify them; additionally, exceptions are identified for nearly every criteria covered by the by-law which makes it lengthy and very difficult to determine what the intent of the regulations are.

**Implications for the Township of Stone Mills**

A combination of the approach taken by Mississippi Mills and the Municipality of Central Manitoulin may work best in the Township of Stone Mills because it would enable stricter regulations around the L&A County Dark Sky Viewing Area while still outlining reasonable exceptions that do not impact the clarity of the night sky.
Penalties/Enforcement

### Penalties/Enforcement Summary

<table>
<thead>
<tr>
<th>Mississippi Mills</th>
<th>Whitestone</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Enforcement is the responsibility of the By-law Enforcement Officer. Notice of violation will be provided by registered mail or in person, which requires the violator to repair, alter, change or remove (offending) lighting within ten days from the receipt of notice. The time may be reduced in dangerous cases at the discretion of the Officer. Refusal by owner to comply will allow the Town to remove the offending lighting at the expense of the owner.</td>
<td>Enforcement is the responsibility of the By-law Enforcement Officers. With regards to inspection, Entry, Powers on Inspection and Application for Warrant, are identified. Failure to comply with the by-law will result in such person being guilty of an offence under this bylaw and upon conviction is liable to a maximum fine as established pursuant to the Provincial Offences Act.</td>
<td>Enforcement is the responsibility of the he administrator who shall give notice by hand delivery or registered mail. The violation must be abated within 30 days of receipt of notice of violation. The municipal staff, planning personnel or CBO shall be available to assist in working with the violator. A civil penalty of $100 and each day of violation after the expiration of the 30-day period shall constitute a separate offense.</td>
</tr>
</tbody>
</table>

### Mississippi Mills

The Mississippi Mills By-law addresses penalties and enforcement in Section 4: Offences and Penalties. Here, enforcement is explicitly stated as the responsibility of the By-law Enforcement Officer. The by-law also outlines the procedure to be carried out if you are found in violation of the by-law; violators of the by-law will be notified “in writing by registered mail, or through a notice delivered directly by the Officer (4.1).” Upon notification, the offending lighting must be “repaired, altered changed, or removed within ten (10) days from the receipt of such notice (4.1).”

In instances where the By-law Enforcement Officer deems the violation to be a public safety concern, notice may be given verbally and may reduce the time period to address the offending lighting at his/her discretion (4.2). In the event that the enforcing officer has required removal of the offending lighting, any existing permits on the property will be revoked (4.3).
The by-law also outlines the consequences for those that do not comply with the notice given by the Enforcement Officer. In this case, the Town will remove the offending lighting at the expense of the owner (4.4).

**Municipality of Whitestone**

In the Municipality of Whitestone’s by-law, penalties and enforcement are outlined in Section 21: Inspection and Offences. It identifies that By-law Enforcement Officers are responsible for enforcement of the by-law. The by-law is very detailed on the specifics of the rights of the Enforcement Officers and homeowners with regards to entering property, the powers of Officers on inspection and obtaining an application for warrant (21.3 & 21.4). For example, Officers may enter and inspect property between 8:00am and 6:00pm; to enter a dwelling during these times, consent must be obtained or a warrant and the Officer must present municipal identification. These specifics help protect both the Officers, and homeowners.

Section 21 also includes the legal jargon with regards to penalties, which states “any person who otherwise contravenes the provisions of this Bylaw is guilty of an offence and upon conviction is liable to a maximum fine as established pursuant to the Provincial Offences Act or any successor legislation (21.5.2).”

**Township of Central Manitoulin**

The light pollution abatement by-law for Central Manitoulin defines penalties in Section 6. Within Section 6.1, the procedure for notification is outlined, “hand delivery or registered mail, return receipt requested” and the time period for correction identified as “within thirty (30) days of receipt of notice of violation” (6.1). The by-law also states “the municipal staff, planning personnel or chief building official shall be available to assist in working with the violator to correct said violation” (6.1).

The by-law specifies in Section 6.2 that if the violation is not corrected within the allotted 30-day period then they will be subject to penalties. The penalty for noncompliance is “one
hundred dollars, and each day of violation after the expiration of the thirty-day period, shall constitute a separate offense for the purpose of calculating the civil penalty” (6.2).

**Strengths and Weaknesses**

All three of the by-laws address Penalties/Enforcement in a standalone section for clarity. They all outline the procedure for receiving notice of a violation, mainly hand delivery or registered mail, and iterate that if the violation is not abated in the set time period then the violator will be subject to an offence and penalties.

The Town of Mississippi Mills clearly identifies how the by-law will be enforced and that non-compliance will see the removal of the offending lighting at the owner’s expense. However, it only gives 10 days for the violation to be rectified and does not explicitly state what fines the violator would be subject to.

The approach taken by the Municipality of Whitestone is authoritative more so than informative. It does not identify the process or time period for rectifying violating lighting. Instead, the section focuses on the rights of the Enforcement Officer to inspect private or public property. No support is given to residents to help them in addressing the violation.

The by-law in the Township of Central Manitoulin is the most citizen-friendly. It permits 30 days for compliance and provides that municipal staff will be available to work with the violator to address the violation. The by-law is also the only one that identifies a clear dollar amount for the violation. On the other hand, the by-law is vague about who can enforce the by-law, stating “the administrator” as the authoritative body permitted to hand out notices.

**Implications for the Township of Stone Mills**

The Township of Stone Mills would benefit by following the approach taken by the Township of Central Manitoulin because it offers support from the municipality in rectifying issues of non-compliance and clearly identifies a dollar amount for the violation, which shows that the municipality is serious about enforcing the new by-law.
Effectiveness of Light Pollution Abatement By-laws

Section 129 of the Ontario Municipal Act enables municipalities to pass by-laws for the regulation of outdoor illumination. It gives municipalities the "authority to prohibit and regulate with respect to noise, vibration, odour, dust, and outdoor illumination, including indoor lighting that can be seen outdoors" (MMAH, 2001). Accordingly, by-laws provide the most effective regulatory tool for regulating light pollution because although the regulations only apply to new lighting fixtures, they allow municipalities to regulate existing development. In contrast, site plan control, an alternative tool typically only applies to new development, and usually only commercial, industrial or institutional.

All three by-laws represent different approaches to regulating light pollution in the community using a light pollution abatement by-law. Their approaches may vary slightly, but the general purpose and goal of each by-law is the same: to protect and promote public health, safety, and welfare, quality of life and the ability to view the night sky by establishing regulations and a process of review for exterior lighting. Ultimately all of the by-laws have helped to: protect against glare, excessive lighting, and light trespass; promote efficient and cost effective lighting; ensure sufficient lighting for safety, visibility and security; and protect and reclaim the ability to view the night sky.

However, measuring the effectiveness of each by-law in achieving this goal is nearly impossible due to the complexity of factors at play. One of the greatest challenges relating to regulation is the difficulty surrounding enforcement. This is because most infractions occur at night and secondly because the enforcement options are limited regarding accuracy of claims against those committing the infractions. Moreover, measuring changes in light pollution levels requires special equipment and cannot be done easily by the municipality. However, in available literature, Mississippi Mills is generally used as an example of an effective light pollution abatement by-law that has successfully helped to preserve the night sky. The analysis supports this but also indicates the Township of Central Manitoulin by-law contains elements that can also be used as precedents.
Additionally, regulation on its own is not sufficient to have a significant impact on light pollution in the community. Light pollution regulations are difficult to enforce in rural areas because most infractions occur at night, outside the regular working hours of by-law enforcement officers. As such, regulations must be supported by other education and advocacy initiatives that complement the goals and purpose of the by-law.
CHAPTER 4: RECOMMENDATIONS & CONCLUSIONS

Summary
The case studies analyzed in the previous chapter present a range of options available to the Township of Stone Mills and other municipalities for formulating and implementing a light pollution abatement by-law. The following table presents a summary of some of the strengths of each of the three approaches.

Table 4.1. Summary of Strengths from Three Municipal By-laws

<table>
<thead>
<tr>
<th>Summary of Strengths</th>
<th>Mississippi Mills</th>
<th>Whitestone</th>
<th>Central Manitoulin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intensity Control</strong></td>
<td>Very clear, detailed, &amp; measurable intensity requirements based on IESNA suggestions</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Shielding Requirements</strong></td>
<td>Comprehensive &amp; clear based on IESNA recommendations with visual appendix</td>
<td>Extensive &amp; detailed but poorly organized</td>
<td>Addressed in the opening sections, consistent with IESNA recommendations</td>
</tr>
<tr>
<td><strong>Light Trespass</strong></td>
<td>User friendly approach offering assistance from the municipality in rectifying violations</td>
<td>High level but effective language</td>
<td>Includes language to highlight impacts of light trespass</td>
</tr>
<tr>
<td><strong>All Night Lighting</strong></td>
<td>N/A</td>
<td>Comprehensive and detailed but difficult to follow</td>
<td>Specific and easy to read restrictions but not all encompassing</td>
</tr>
<tr>
<td><strong>Prohibitions</strong></td>
<td>Special consideration given to the area around the observatory</td>
<td>Includes most detailed restrictions</td>
<td>Includes toxic lighting &amp; max height restrictions but does not address obnoxious lighting</td>
</tr>
<tr>
<td><strong>Exceptions</strong></td>
<td>Outlines process for temporary exemptions and does not exempt the area around the observatory</td>
<td>Cover main exception categories</td>
<td>Presents logical and reasonable exemptions</td>
</tr>
<tr>
<td><strong>Penalties/Enforcement</strong></td>
<td>Includes outcome of non-compliance and clear process of notification</td>
<td>Clear and concise in terms of enforcement but very authoritative approach</td>
<td>Presents most citizen friendly approach – provides greatest time for compliance and offers municipal support</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Identifies a dollar amount for penalties</td>
</tr>
</tbody>
</table>
Recommendations

From the analysis of the three case studies, the following are suggestions for the Township of Stone Mills to consider when writing a light pollution abatement by-law. These recommendations best fit the rural character of the community and best meet the goals of a light pollution abatement by-law. These recommendations were based on the strengths and weaknesses analysis and the implications for the Township of Stone Mills outlined for each category within Chapter 3.

Intensity Control

- Clear and measurable requirements for intensity should be prominently included. To determine appropriate requirements for various lighting applications, use the Illuminating Engineering Society of North America (IESNA) recommendations found in The Lighting Handbook & Outdoor Lighting Code Handbook. These recommendations have been developed by professionals to improve the public lighted environment and will provide an acceptable standard.
- Relate intensity control with shielding requirements and light trespass to prevent repetition and provide clarity.

Shielding Requirements

- Use language such as “shall” or “must” and outline shielding requirements at the beginning of the application section of the by-law as per Mississippi Mills and the Municipality of Central Manitoulin. Although not legally significant, this logically emphasizes the importance of shielding requirements in limiting light pollution.
- Develop shielding requirements based on IESNA recommendations. This will help ensure continuity with intensity controls and provide a detailed and well-established requirement that is easy to monitor and enforce.
- Include a visual appendix with examples of acceptable and unacceptable lighting fixtures, and shielding solutions for existing fixtures. It would also be beneficial to provide a comprehensive definition of full cut off fixtures with examples as per the IESNA definition.
**Light Tresspass**

- Adopting a user friendly approach to addressing light trespass is recommended. Including and establishing a process that enables residents to obtain advice on proper shielding to prevent light trespass will benefit residents.
- Consider establishing an Outdoor Lighting Committee to provide residents with information on light trespass and more generally light pollution, and to help aid in finding solutions to light trespass violations.
- Keep language high level but include language that highlights the impacts of light trespass to raise awareness of the issue. Consider a clause similar to Central Manitoulin’s by-law: “Lighting fixtures shall be shielded and/or directed in such a manner that they illuminate only the area intended and do not spill over into neighbouring areas so as to interfere with the peaceful enjoyment of residential or public properties.”

**All Night Lighting**

- Contain all restrictions on all night lighting to one section.
- Restrict outdoor lighting other than security lighting between 11pm and sunrise.
- Recognize that extended hours for outdoor recreational lighting may be required on occasion for recreational or sporting events by including as an exception (i.e. Canada Day or tournaments etc.).
- Encourage residents to utilize electronic timers to ensure fixtures are shut off between 11pm and sunrise. Timers not only will help with compliance but will save energy and ultimately money for local residents.

**Prohibitions**

- Restrictions at a minimum should cover all of the following: toxic lighting (i.e. mercury vapour etc.), obnoxious lighting (i.e. laser source lights), and outdoor advertising sign lighting.
- Consider developing a special set of considerations for the area around the Lennox and Addington County Dark Sky Viewing Area; as per Mississippi Mills by-law,
illuminated signs, non full cut off cobra lighting, and pole spacing ratios less than 10 are prohibited within a 4 kilometre radius of the Fred Lossing Observatory. These restrictions can help protect the area immediately around the Dark Sky Viewing Area from future development.

Exceptions

- Keeping with standard practice, acknowledge that existing luminaries are grandfathered and thus exempted from the provisions of the by-law.
- Keep exceptions high level and minimal. Listing lots of specific and detailed exceptions makes it difficult for readers to interpret and apply the by-law, so select exemptions carefully and meaningfully. Examples of common exceptions include: low intensity lighting, sports facilities (when not in use) and airport or other navigational lighting.
- Outline the process for applying for temporary exemptions for events that are temporary in nature.

Penalties/Enforcement

- Identify who can enforce the by-law, how notice is given, and the process of enforcement of the by-law to provide residents with an open understanding of the consequences of violation.
- Utilize a citizen friendly approach to regulation; such an approach may make municipal staff available to assist in working with the violator to address the issue or provide extra time for compliance if warranted. Establishing an educational stance will provide the greatest benefit to the community as a whole.
- Clearly state the outcomes of non-compliance and identify a dollar amount for the civil penalty for each day of violation after the expiration of the compliance period. Affixing a dollar amount to the violation will alert residents that the Township is taking light pollution seriously.
**Further Research**

Although the recommendations presented above represent a starting point for developing a light pollution abatement by-law in the Township of Stone Mills, further research would benefit their development to fruition. Further research could examine more case studies and a wider variety of case studies; looking at case studies outside of Ontario may provide a better view of existing outdoor lighting by-laws and highlighted missing components from existing Ontario legislation.

Moreover, due to time constraints, interviews were not conducted with planning staff. Furthering the research through interviews would provide an opportunity to better understand the individual needs of the municipality including person-power available, budgetary considerations, and other relevant factors. Also, contacting municipal employees at each of the three case study locations would provide insight into qualitative/quantitative measures of success/challenges. Through interviews, a stronger set of recommendations could be provided for implementation.

Lastly, further research topics could include:

- Local regulation versus a provincial/national approach to light pollution.
- An in-depth look at alternative solutions to addressing light pollution, including retrofit-benefit programs, grants, economic incentives and advocacy.
- Examining whether enforcement or advocacy and education programs complementary to by-laws are more effective.
- Challenges in addressing light pollution in rural versus urban settings.
- Considering whether renovation projects should trigger retrofitting of fixtures.

In examining these research topics, a better understanding of addressing light pollution would be had and could ultimately contribute to helping the Township of Stone Mills develop a better all-encompassing strategy for addressing light pollution.
Conclusions
The Township of Stone Mills is in an excellent position to create a light pollution abatement by-law that protects the health and integrity of the area’s night sky because it has a keen interest in sustainability and is home to the County’s Dark Sky Viewing Area. Applying these recommendations is an important next step to proactive stewardship and ensuring that the community continues to move towards achieving a sustainable night environment for future generations. Although municipal by-laws are one way of limiting light pollution, the process of by-law enactment is complex and will take time. It is necessary to couple regulations with voluntary initiatives including advocacy and education, as a means of opening people’s perceptions and promoting behavioural change. Striking a balance between regulation and advocacy provides a challenge for local municipalities but also presents the greatest opportunity for effectively reducing light pollution within the community.
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Municipality of Whitestone. *Light Pollution By-law No. 16-2006.* Available at: http://www.whitestone.ca/bylaws/lighting.html


Township of Central Manitoulin. *Outdoor Lighting Control and Dark Sky By-law #2003-16.* Available at: http://www.centralmanitoulin.ca/sites/default/files/03-16_outdoor_lighting_control_act.pdf


APPENDICES

Appendix A: Mississippi Mills By-Law No. 03-62

Preservation of Our Night Sky
The Town of Mississippi Mills is proud to be a leader in the preservation of our night sky.

The Town of Mississippi Mills recognizes that the night sky is a precious natural resource that needs protection. The quality of our night sky is vastly superior to that found in most areas of the province. It is a defining element of rural, small town character that is under threat and in many respects is no different than our farmland and our wetlands. It requires action in order to preserve the quality of the night sky that we enjoy.

The Town is home to the Fred Lossing Observatory located at the Mill of Kintail Conservation Area. This observatory is maintained and operated by the Royal Astronomical Society of Canada and was built by the scientific community with high-quality optics from the National Research Council of Canada. The high quality of the night sky available at the observatory has lead to the discovery of five comets, the most by any observatory in Canada.

Direct light upwards not only erodes the quality of our night sky, it also wastes up to 30% of the energy of the lighting product, creates glare and a traffic hazard, wastes money and creates a health hazard for all of us. Recognizing this, in 2003 the Town of Mississippi Mills passed a by-law to preserve the quality of our night sky by requiring new exterior lighting to meet a 'full cut-off' standard.

Please see our Good Neighbour Lighting Brochure for helpful suggestions and products which can ensure you do your part in protecting the quality of our night sky.

THE CORPORATION OF THE TOWN OF MISSISSIPPI MILLS

BY-LAW NO. 03 – 62

BEING a By-law to Regulate Outdoor Illumination and Control Light Pollution to ensure responsible lighting, light pollution abatement and the conservation of the night sky environment.

WHEREAS Section 129 of the Municipal Act 2001, S.O. 2001 c.25 provides municipalities with the authority to prohibit and regulate with respect to noise, vibration, odour, dust, and outdoor illumination, including indoor lighting that can be seen outdoors.

AND WHEREAS the Council of the Corporation of the Town of Mississippi Mills deems it desirable to enact a by-law respecting the regulation and control of outdoor illumination, and control light trespass, as well as to ensure the continued astronomical importance of the Fred Lossing Observatory, located at the Mill of Kintail;

AND WHEREAS properly designed light fixtures do not emit undesirable illuminating light rays into the night sky and thus protect the night-time environment;

NOW THEREFORE the Council of the Corporation of the Town of Mississippi Mills enacts as follows:
SECTION 1: DEFINITIONS

For the purposes of this By-Law, terms used shall be defined as follows:

Direct Light means light emitted directly from the lamp, off the reflector or luminaire.

Fixture means the assembly that houses the lamp or lamps and can include all or some of the following parts: a housing, a mounting bracket or pole socket.

Flood or Spot light means any light fixture or lamp that incorporates a reflector or a refractor to concentrate the light output into a directed beam in a particular direction.

Footcandle means a measure of luminance per unit area used in IESNA standard measurements i.e. one footcandle (fc) equates to one lumen per square foot.

Full-Cut-Off Fixture means a luminaire or light fixture that; by design of the housing, does not allow any light dispersion or direct glare to shine above a horizontal plane from the base of the fixture where light is emitted and must be installed in a horizontal position as designed. These fixtures produce no glare or stray light due to the exposure of the bulb light source because the source is recessed or shielded.

Glare means light emitting from a luminaire with an intensity great enough to reduce a viewer's ability to see, and in extreme cases causing momentary blindness.

Grandfathered Luminaires means luminaires not conforming to this code that were in effect prior to the passage of this by-law.

Height of Luminaire means the height of a luminaire as calculated by the vertical distance from the ground directly below the centerline of the luminaire to the lowest direct-light-emitting part of the luminaire.

IESNA means the Illumination Engineers Society of North America, which is the standards committee for responsible outdoor lighting. This is an organization that recommends lighting levels and lighting fixtures.

Indirect Light means direct light that has been reflected or has scattered off other surfaces.

Lamp means the component of a luminaire that produces the actual light.

Light Trespass means the shining of light produced by a luminaire beyond the boundaries of the property on which it is located.

Lumen means a unit of luminous flux equal to the light emitted in a unit solid angle by a uniform point source.

Luminaire means a complete lighting system, including a lamp or lamps and a fixture.
Outdoor Light Fixture means outdoor artificial illuminating devices, installed or portable, used for flood lighting, general illumination or advertisement.

Pole Spacing Ratio means the ratio of the inter-pole distance per effective height of lamp on the pole.

Sharp-Cut-Off Fixture means the same as Full-Cut-Off Fixture.

Town means the Corporation of the Town of Mississippi Mills.

Uniformity Ratio of Lighting means the average level of illumination in relation to the lowest level of illumination for a given area.

Wall Pack Light Fixture means flood light fixtures on exterior walls of buildings

SECTION 2: REGULATIONS

2.1 General Regulation

Any person who installs outdoor lighting within the boundaries of the Town shall do so in conformity with the requirements of this By-Law. If conflicts arise regarding control and maintenance of outdoor lighting, this By-Law shall be the governing document.

2.2 Luminaire Design Factors For Outdoor Area

Any person installing an outdoor lighting fixture shall be required to use completely shielded Full-Cut-Off fixtures, as identified in Appendix I attached hereto and forming part of this by-law. Outdoor lighting fixtures shall include, but are not limited to, lights for: buildings and structures, including canopies and overhangs; recreational areas; parking lot lighting; landscape lighting; billboards and signs; public and private street lighting; display and service area lighting; public and private walkway lighting; rural barn lights; residential yard lights; and outdoor lighting for all residential, commercial, industrial, institutional and provincial and federal government uses not otherwise specified.

2.2.1 Municipal Street Lights and Residential Areas

The Town shall strive to maintain outdoor street lights that have the following:

1. Uniform light levels within the urban area that do not exceed uniformity ratios recommended by the IESNA

2. Minimum light used for safety that does not exceed IESNA recommendations.

3. Full-Cut-Off fixtures examples of which are identified in Appendix I

4. The recommended values for average surface illumination and uniformity ratios for illuminated areas as identified in Table I of Appendix I.

2.3 Street Lighting Design

All new municipal outdoor street lighting must be Full-Cut-Off Fixtures installed in accordance with
IESNA standards. Any existing grandfathered partially cut-off street lighting shall be replaced by Sharp-Cut-Off fixtures when lamp replacement is required. The lamp wattage design requirements for both new and grandfathered street lighting shall be as follows:

a) 70 W for Residential

b) 100 W for Intersections

c) 100-200 W for major thoroughfares

d) 200 W for pole spacing ration of greater than 5:1

e) Pole spacing ratio not to exceed IESNA luminance and uniformity factors

f) Pole spacing ratio assumes values 3:1 to 10:1 based on usage (traffic, residential, etc)

2.4 Structural Illumination

2.4.1 All new wall-mounted commercial lighting shall be Full-Cut-Off fixtures.

2.4.2 All existing grandfathered wall-mounted lights shall be encouraged to adhere to the requirements of Section 2.2. Property owners whose structures are furnished with unshielded wallpacks shall be encouraged to shield such fixtures.

2.4.3 All architectural lighting and building accent lighting shall be mounted such that the accent light is aimed down. There shall be no glare emanating from the fixture in accordance with fully shielded design.

2.4.4 The use of low wattage lights for decoration purposes such as Christmas lighting and property ornamentation shall be exempt from Section 2.4.3.

2.5 Property Illumination

All artificial lighting for yards and parking areas shall be arranged so as to eliminate light trespass. Light trespass may be reported to the Mississippi Mills Outdoor Illumination Committee for problem resolution.

2.6 Provisions For Shielding Exterior Lighting to reduce Light Trespass

Applications may be made to the Mississippi Mills Outdoor Illumination Committee to obtain advice for proper shielding in the form of visors, rotational adjustments, etc. to street lighting that cause light trespass. Examples are provided in Appendix I.

2.7 Lighting Of Outdoor Advertising Signs

The Town’s Sign By-law No. 02-98 Section 5.2 shall regulate the lighting of outdoor advertising signs.

2.8 Recreational Facilities
2.8.1 Any light source permitted by this By-law may be used for lighting of outdoor public or private recreational facilities, such as, but not limited to, football fields, soccer fields, baseball fields, softball fields, tennis courts, or show areas, provided all of the following conditions are met:

a. All fixtures used for event lighting shall be Full-Cut-Off Fixtures, or be designed or provided with sharp cut-off capability by a shielding retrofit, so as to minimize up-light, spill-light, and glare.

b. A facility's lighting shall be turned off when not in use.

c. Owners of grandfathered lighting fixtures at outdoor recreational facilities are encouraged to install shielding fixtures when maintenance and replacement occurs.

2.9 Prohibitions

2.9.1 Laser Source Light

The use of laser source light or any similar high intensity light for outdoor advertising or entertainment purposes is prohibited.

2.9.2 Searchlights

The operation of searchlights for advertising or entertainment purposes is prohibited.

2.9.3 Outdoor Advertising Off-Site Signs

Electrical illumination of outdoor advertising off-site signs along roadways is prohibited after business hours.

2.10 Request For Exemption For Temporary Events

Any person may submit a written request on a form prepared by the Outdoor Illumination Committee for a temporary exemption to the requirements imposed by this By-law. The request for lighting exemption for temporary events shall contain the following information:

a. Specific exemption requested (i.e. searchlights)

b. Type and use of exterior light involved

c. Date of the event

d. Duration of time for requested exemption

e. Proposed location of exterior light

f. Physical size of exterior light
2.11 Grandfathering of Nonconforming Luminaires

2.11.1 All luminaires and luminous advertising signs lawfully in place prior to the date of passing of the By-law shall be grandfathered. Any luminaire that replaces, modifies, or moves a grandfathered luminaire shall be required to meet the provisions of this By-law.

2.11.2 Existing luminaires which are determined by the Outdoor Illumination Committee to direct light toward streets or parking lots and cause glare to motorists or cyclists and therefore deemed to be a public safety concern, shall be either shielded or re-directed within 90 days of notification to the owner.

2.12 Establishment of the Mississippi Mills Outdoor Illumination Committee

The maintenance of this By-law shall be the responsibility of a committee known as the Mississippi Mills Outdoor Illumination Committee. The Committee’s responsibility is to help enforce this By-law in both new and existing developments by:

a. providing consultation on outdoor and building lighting design

b. providing outdoor lighting problem resolution (light trespass and light pollution)

c. conducting standards research and area investigation

d. examining submissions for new lighting developments

2.13 Conservation of Night Sky Environment Near The Fred Lossing Observatory (FLO)

Due to the light sensitive nature of the astronomical operation of the Fred Lossing Observatory, zoned protection shall be implemented appropriate to the existing and planned land use within four (4) kilometers of this site. Any new development within four (4) kilometres of FLO must comply with the provisions as outlined in Table 2 of Appendix 1, attached hereto and forming part of this By-law and provide documentation indicating the types and number of fixtures to be installed. Existing luminaries shall be compliant within five (5) years from the date of adoption of this provision and shall not be grandfathered. The Outdoor Illumination Committee shall address and resolve problems with unshielded illumination in this area.

SECTION 3: NEW DEVELOPMENT INVOLVING OUTDOOR LIGHTING

3.1 Submission Contents

The applicant for a permit required by this By-law involving outdoor lighting fixtures shall submit to the Outdoor Illumination Committee as part of the application for permit, evidence that the proposed work will comply with this By-law. The submission shall contain, but shall not necessarily be limited to, the following:

a. Plans indicating the location of lighting on the premises, and the type of illuminating devices, fixtures, lamps, supports, reflectors, and other devices;
b. Description of the illuminating devices, fixtures, lamps, supports, reflectors, and other devices and the description may include, but is not limited to, catalogue cuts by manufacturers and drawings (including sections where required):

c. Photometric data, such as that furnished by manufacturers, or similar documentation showing the angle of cut off or light emissions.

The above required plans, descriptions and data shall be sufficiently complete to enable the Mississippi Mills Outdoor Illumination Committee to readily determine compliance with the provisions of this By-law. If the information is deemed to comply with the provisions of the By-law, a permit will be issued by the Outdoor Illumination Committee. If such plans, descriptions and data are not sufficient to allow the Outdoor Illumination Committee to determine compliance by reason of the nature or configuration of the devices, fixtures, or lamps proposed, the applicant shall consult with the Mississippi Mills Outdoor Illumination Committee to find an acceptable solution.

3.2 Lamp or Fixture Substitution

Should it be necessary for any outdoor light fixture, or the light source therein to be changed after the permit has been issued, a change request must be submitted to the Chief Building Official and forwarded to the Outdoor Illumination Committee for approval, together with adequate information to enable the Outdoor Illumination Committee to ensure the provisions of this By-law are met, prior to implementing the installation.

SECTION 4: OFFENCES AND PENALTIES

4.1 Whenever the By-law Enforcement Officer, after inspecting lighting including portable lighting, finds such lighting to be in violation of the provisions of this By-law, he/she shall notify the owner of the property and the owner of the sign in writing by registered mail, or by causing a notice to be delivered personally to such owner(s) requiring them to repair, alter, change, or remove such lighting within ten (10) days from the receipt of such notice.

4.2 Where the repair, alteration change or removal of lighting is a matter of extreme urgency so as to be a danger to the public, or motorists or any other situation deemed to be dangerous, the By-law Enforcement Officer may give notice verbally and may reduce the period within which, in his/her sole discretion, is adequate, taking into account the circumstances at the time the notice is given.

4.3 Where removal is required, the notice as provided for in Sections 4.1 and 4.2. above shall terminate any existing permit.

4.4 Refusal by the owner to comply with Section 4.1 or 4.2 will allow the Town to remove the offending lighting at the expense of the owner and the expenses incurred may be recovered in like manner as municipal taxes.

4.5 Every person who contravenes any provisions of this By-law is guilty of an offence and on conviction is liable to a fine as provided in the Provincial Offences Act, Chapter P.33, R.S.O. 1990 as amended.
SECTION 5: SEVERABILITY

Should any part, section, subsection or portion of this By-law be repealed or declared by a court of competent jurisdiction to be illegal, the same shall not affect the validity of the By-law as a whole or in part thereof, except for that which was declared to be invalid.

SECTION 6: EFFECTIVE DATE

This By-Law shall take effect upon the date of passing thereof.

READ a first time this 9th day of September, 2003.

READ a second time this 9th day of September, 2003.

READ a third time, passed, signed and sealed in open Council this 9th day of September, 2003.

_________________________  ______________________
F.R. (Ron) Pettem, Mayor Cynthia Halcrow, Clerk
Full or Sharp Cut Off Definition
Examples of Acceptable / Unacceptable Lighting Fixtures

Unacceptable / Discouraged
Fixtures that produce glare and light trespass

- Unshielded Floodlights or Poorly-shielded Floodlights
- Unshielded Wall Packs & Unshielded or Poorly-shielded Wall Mount Fixtures
- Deep Lens & Seg Lens Fixtures
- Unshielded Streetlight
- Unshielded Security Light
- Unshielded PAR Floodlights

Acceptable
Fixtures that shield light sources to minimize glare and light trespass and to maintain better vision at night

- Full Cutoff Fixtures
- Fully Shielded Wall Pack & Wall Mount Fixtures
- Fully Shielded Post Light Fixtures
- Fully shielded Pedestal Style Fixtures
- Shielded/Property-amended PAR Floodlights
- Flush Mounted Canopy Fixtures
SHIELDING SOLUTIONS FOR EXISTING FIXTURES

TYPICAL WALLPACK LUMINAIRE USING OPAQUE SHIELD RETROFIT

Figure 1

Shielding Solution for existing Street lamp – Kanata Ontario - 2003
The following sources of illumination have been rated by preferential order for outdoor use:

<table>
<thead>
<tr>
<th>Source</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Pressure Sodium (LPS)</td>
<td>1 - Recommended</td>
</tr>
<tr>
<td>High Pressure Sodium (HPS)</td>
<td>2 - Acceptable</td>
</tr>
<tr>
<td>Other High Intensity Discharge Lights</td>
<td>3</td>
</tr>
<tr>
<td>Incandescent</td>
<td>4</td>
</tr>
<tr>
<td>Fluorescent</td>
<td>5</td>
</tr>
<tr>
<td>Quartz Halogen lights</td>
<td>6</td>
</tr>
</tbody>
</table>

Notes:

HID sources include mercury vapor, metal halide, high-pressure sodium and low-pressure sodium. The benefits of HID sources are their high efficacy in lumens per watt and long lamp life (20,000 hours). HID is also a point source, which provides the opportunity for better light control. Light can be better directed where it is needed.

Most lamps on the market today can be categorized into three groups: high intensity discharge (HID), incandescent and fluorescent.

1. Low Pressure Sodium (LPS) is HID. It is good because the monochromatic yellow light emitted can be filtered out at the telescope. It is also the single most efficient light source (30% more efficient than HPS).

2. High Pressure Sodium (HPS) also HID, is used in the standard street light luminaire – accepted when fixture is a Full-Cut-Off Fixture

3. Other HID lights (Metal Halide, Mercury Vapour) can be classified as accepted only if properly shielded. Certain applications requiring whiter light use these sources. These should be in totally enclosed luminaires.

4. Incandescent lights are accepted if fully shielded. It should be noted that warm white natural lights are usually preferred over fluorescent lights. Note also that for outdoor applications, these are less efficient than HPS or LPS. Incandescent is a spectral continuum of light, and therefore cannot be filtered

5. Fluorescent light – normally incandescent is preferred for the warmer white light and is accepted if shielded.

6. Quartz Halogen lights are normally used in security applications. They are high power flood lamps and produce significant radiation both in the visible and non-visible spectrum. They are not recommended. They should be replaced by properly shielded HID (High Intensity Discharge) lights.
APPENDIX 1

TABLE 1

The following IESNA standards have been adapted for outdoor lighting and light levels in Mississippi Mills. These values serve as design guidelines when considering development of new outdoor lighting as well as standard criteria when measuring existing areas of outdoor illumination.

<table>
<thead>
<tr>
<th>Roadway Lighting</th>
<th>Average Maintained Illuminance (fc)</th>
<th>Uniformity Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Road</td>
<td>0.6 – 1.6</td>
<td>3:1</td>
</tr>
<tr>
<td>Collector Road</td>
<td>0.4 – 1.1</td>
<td>4:1</td>
</tr>
<tr>
<td>Local Road</td>
<td>0.3 – 0.8</td>
<td>6:1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Public Spaces and Usage Levels</th>
<th>Horizontal Illuminance (fc)</th>
<th>Uniformity Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Shopping Centres</td>
<td>0.6 – 2.4</td>
<td>4:1</td>
</tr>
<tr>
<td>Cultural, Civic or Recreational Events</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office Parking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airports, Commuter Lots, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential Complex Parking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital Parking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighbourhood Shopping</td>
<td>0.2 – 0.8</td>
<td>4:1</td>
</tr>
<tr>
<td>Industrial Employee Parking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational Facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Churches</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE 2

Outdoor Illumination Control for Fred Lossing Observatory (FLO)

Table 2 details unshielded or inappropriate outdoor lighting sources which shall not be permitted within four (4) kilometers of the FLO site.

<table>
<thead>
<tr>
<th>Lighting Requirements</th>
<th>Within 4km radius of FLO</th>
<th>Beyond 4km radius of FLO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illuminated Signs</td>
<td>Prohibited</td>
<td>Permitted</td>
</tr>
<tr>
<td>NON-Full Cutoff Cobra</td>
<td>Prohibited</td>
<td>Permitted</td>
</tr>
<tr>
<td>Pole Spacing Ratio &lt; 10</td>
<td>Prohibited</td>
<td>Permitted</td>
</tr>
</tbody>
</table>
Appendix B: Municipality of Whitestone By-Law No. 16-2006

MUNICIPALITY OF WHITESTONE

BYLAW NO. 16-2006 TO REGULATE LIGHT POLLUTION

Whereas the Municipal Act, 2001, Revised Section 129 (1) authorizes municipalities to pass bylaws to prohibit and regulate outdoor illumination including indoor lighting that can be seen outdoors. And whereas the Municipality of Whitestone permits the Council of the Municipality to pass bylaws for prohibiting or regulating outdoor light fixtures. Now therefore the Council of the Corporation of the Municipality of Whitestone enacts as follows:

1. GENERAL

Mission Statement
To afford every citizen of the Municipality of Whitestone the flexibility to engage in the pursuit of safe, inexpensive lighting practices for the purpose of commercial and private use without being impeded upon or impeding upon other citizens desiring a more pristine night time environment free from light pollution, waste, trespass, or clutter while providing night-time safety, security and productivity.

Purpose & Intent
The use of outdoor lighting is often necessary for adequate nighttime safety and utility, but common lighting practices can also interfere with other legitimate public concerns. Principal among these concerns are
1. the degradation of the nighttime visual environment by production of unsightly and dangerous glare
2. unnecessary waste of energy and resources in the production of too much light or wasted light
3. interference in the use or enjoyment of property which is not intended to be illuminated at night
4. the loss of the often-neglected scenic view of the heavens due to increased urban sky-glow. It is hereby recognized that these different interests, those of safety and utility and those of aesthetic appearance, need not compete. Good modern lighting practices can provide adequate light for safety and utility without excessive glare or light pollution. In nearly all cases, careful attention to questions of when and where and how much nighttime lighting is needed, will lead to better lighting practice from all viewpoints
Accordingly, it is the intent of this Bylaw to encourage lighting practices and systems which will minimize light pollution, glare, light trespass, and conserve energy while maintaining night-time safety, utility, security and productivity.

Conflicting Regulations
In the event of conflict between the regulations set forth in this Bylaw and any other
regulations applicable to the same area, the more stringent limitation or requirement shall govern.

Approved Materials and Methods of Construction
The provisions of this Bylaw are not intended to prevent the use of any design, material or method of installation or operation not specifically prescribed by this Bylaw, provided any such alternate has been approved by the Planning & Development Committee and Council.
The Planning & Development Committee and Council may approve any such proposed alternate provided that such alternates
1. provide at least equivalence to the applicable specific requirements of this Bylaw
2. are otherwise satisfactory and complies with the intent of this Bylaw

2. DEFINITIONS
Automatic timing device means a device which automatically turns light fixtures or circuits on and off
Accessory building means a detached building located on the same lot as the main building, the use of which is incidental or subordinate to that of the main building
Abandonment means the discontinuation of use for a period of six months
Building has the meaning ascribed to it in the Building Code Act, 1992, c. 23 as amended or any successor legislation
Bylaw Enforcement Officer means all individuals from time to time appointed by Council of the Corporation as Bylaw Enforcement Officers for the purpose of enforcing the provisions of this Bylaw
Chief Building Official means the municipality’s Chief Building Official
Development project means any residential, commercial, industrial or mixed use subdivision plan or individual building development or remodeling plan which is submitted to the municipality for approval
Designated Official means the designated by Council of the Municipality to administer certain provisions of this Bylaw
Direct illumination means illumination resulting from light emitted directly from a lamp, luminary or reflector, not light diffused through translucent signs or reflected from other surfaces such as the ground or building
Dwelling unit means a suite operated as a housekeeping unit, used or intended to be used as a domicile by 1 or more persons and usually containing cooking, eating, living, sleeping and sanitary facilities
Existing outdoor light fixtures means a light fixture, permanent or portable, used out of doors, that was in place before the passing of this Bylaw including illumination or advertisement for the following:
1. buildings and structures
2. recreational areas
3. parking lot lighting
4. landscape and architectural lighting
5. billboards and other signs (advertising or other)
6. street lighting
7. product display area lighting
8. building overhangs and open canopies

**Fully shielded fixture** means that fixtures are shielded in such a manner that light rays emitted by the fixture, either directly from the lamp or indirectly from the fixture, are projected below a horizontal plane running through the lowest point on the fixture where light is emitted.

**Grade** means, with reference to a building or to an outdoor light fixture affixed to a building, the average level of proposed or finished ground adjoining the Building at all exterior walls and, when used with reference to an outdoor light fixture affixed to a pole or to a structure other than a building, means the average level of proposed or finished ground immediately surrounding such pole or structure other than a building.

**Internally illuminated sign** means a sign of which all or part of the external surface emits light received from an internal light source.

**Installed** means attached, or fixed in place, whether or not connected to a power source.

**Lamp** means an artificial source of light and includes a bulb or tube.

**Light trespass** is spill light falling over property lines that illuminates adjacent grounds or buildings in an objectionable manner.

**Lane** means a public or a private means of access which affords a secondary means of access to an abutting property in addition to a Street or road.

**Light fixture** means a complete artificial lighting unit consisting of one or more lamps and ballasting, where applicable, together with parts designed to distribute the light, position and protect the lamps and connect the lamps to the power supply.

**Lot** means a parcel or tract of land.

1. which is a whole lot as shown on a registered plan of subdivision, but a registered plan of subdivision for the purpose of this definition does not include a registered plan of subdivision which has been deemed not to be a registered plan of subdivision under a bylaw passed pursuant to Subsection 50(4) of the Planning Act or a predecessor thereof or
2. which fronts on a Street and is a separate parcel of land without any adjoining lands being owned by the same owner or owners as of the date of passing of this Bylaw
3. the description of which is the same as in a deed which has been given consent pursuant to Section 50 of the Planning Act, or a predecessor thereof, but for the purpose of this definition, no parcel or tract of land ceases to be a lot by reason only of the fact that part or parts of it has or have been conveyed to or acquired by the Municipality, Her Majesty in Right of Ontario, Her Majesty in Right of Canada.

**Lumen** is the unit used to measure the actual amount of visible light, which is produced by a lamp as defined by the manufacturer.

**Luminary** means the complete lighting assembly, less the support assembly.

**Municipality** means The Municipality of Whitestone.

**Multi-class lighting** means any outdoor lighting used for more than one purpose, such as security and decoration, when those purposes fall under the definitions for two or more lighting classes as defined for Class 1, 2 and 3 Lighting below.

**Motion sensing security lighting** means a fixture designed, and properly adjusted, to
illuminates an area around a residence or other building by means of switching on a lamp when motion is detected inside the area or perimeter, and switching the lamp off when the detected motion ceases.

**Neon lighting** means lighting using luminous gas filled tubes often formed into text, symbols or decorative elements. Neon lighting includes tubes with typical diameters of 10 to 20 millimeters (.4 inch to .8 inch) filled with neon, argon, xenon, or other gasses and producing various colors of light. Not included are replaceable 3.81 cm. diameter and 2.54 cm. diameter (1 inch diameter and 1.5 inch diameter or PL (compact) fluorescent tubes.

**Outdoor light fixture** means a light fixture, permanent or portable, used or for use out of doors, includes illumination or advertisement for the following: 1. buildings and structures 2. recreational areas 3. parking lot lighting 4. landscape and architectural lighting 5. billboards and other signs (advertising or other) 6. street lighting 7. product display area lighting 8. building overhangs and open canopies 9. security lighting

**Class 1 lighting** means all outdoor lighting used for but not limited to outdoor sales or eating areas, assembly or repair areas, advertising and other signs, recreational facilities and other similar applications where color rendition is important.

**Class 2 lighting** means all outdoor lighting used for but not limited to illumination for walkways, roadways, equipment yards, parking lots and outdoor security where general illumination of the grounds is the primary concern.

**Class 3 lighting** means any outdoor lighting used for decorative effects, including but not limited to architectural illumination, flag monument lighting, and illumination of trees, bushes, etcetera.

**Outdoor recreation facility** means an area designed for active recreation, whether publicly or privately owned, including but not limited to parks, baseball diamonds, soccer and football fields, golf courses, tennis courts and swimming pools and snow skiing, carried on in whole or in part outside a fully-enclosed building and together with necessary accessory Buildings and structures or open areas not having a building, provided such activities are permitted under the zoning bylaw.

**Owner** includes the registered owner of real property, the person who owns a leasehold estate in real property, and any person having control of real property, and also includes a person the owner authorizes in writing to act on his or her behalf.

**Person** means any individual, partnership, joint venture, corporation or company, firm, association, society or other entity.

**Planning & Development Committee** is a committee comprising of all members of Council and members at large appointed by Council to discuss planning related issues.

**Shielded** means that 98% of the lumens emitted from the light fixture are projected below an imaginary horizontal plane passing through the highest point on the fixture from which light is emitted.
**Sign** means any advertising device or notice and means any medium including its structure and any other component parts which is used or is capable of being used to attract attention to a specific subject matter

**Street** means a public highway as defined by the Municipal Act and shall exclude a Lane or any private right-of-way or unopened road allowance or any street which is shown on a registered plan of subdivision which has been deemed not to be a registered plan of subdivision for the purposes of Subsection 50(3) of the Planning Act, or a predecessor thereof

**Street townhouse** means a building divided vertically into three or more dwelling units, each of which shares a wall above grade, and each of which has frontage on a street

**Security lighting** is lighting designed to illuminate a property or grounds for the purpose of visual security. This includes fully shielded lighting designed to be left on during night time hours as well as motion sensing lighting fixtures

**Temporary lighting** means lighting which does not conform to the provisions of this Bylaw and which will not be used for more than one thirty (30) day period within a calendar year. Temporary lighting is intended for uses which by their nature are of limited duration e.g. holiday decorations, civic events, or construction projects

**Total outdoor light output** means the maximum total amount of light, measured in lumens, from all outdoor light fixtures on a property. For lamp types that vary in their output as they age (such as high pressure sodium and metal halide), the initial output, as defined by the manufacturer, is the value to be considered

**Unshielded fixture** means a fixture that allows light to be emitted above the horizontal directly from the lamp or indirectly from the fixture or a reflector

**Watt** is the unit used to measure the electrical power consumption (not the light output) of a lamp

### 3. APPLICATION AND COMPLIANCE

**Application**
Except as otherwise provided in this Bylaw, this Bylaw applies to all outdoor light fixtures erected, installed or used in the Municipality of Whitestone in conjunction with the following:

a. commercial uses, including parking lots;
b. industrial uses;
c. institutional uses;
d. recreational or athletic uses; or

e. residential uses of five Dwelling Units or more on a single Lot.

All Outdoor Light Fixtures which produce light directly or indirectly by the combustion of natural gas or other fossil fuels, such as gas lamps, are exempt from the requirements of the Bylaw.

Nothing in this Bylaw prohibits the temporary display of incandescent lights, other than search lights, as part of the celebration of a religious or cultural event during a reasonable period of celebration of that event which reasonable period shall in no
event extend for more than thirty days prior to the date of the event or celebration or thirty days after such date.

Compliance
No Person shall erect, install or use, or permit to be erected, installed or used, an Outdoor Light Fixture otherwise than in compliance with the provisions of this Bylaw.

4. PREFERRED SOURCES FOR COMMERCIAL, STREET, AND PUBLIC LIGHTING
Due to their high energy efficiency, long life and spectral characteristics, low-pressure sodium (LPS) lamps are the preferred illumination source throughout the Municipality. Their use is encouraged for outdoor illumination whenever possible.

5. TEMPORARY LIGHTING PERMITS
1. The Council may grant a permit for temporary lighting if all of the following conditions are met:
   1. The purpose for which the lighting is proposed is not intended to extend beyond thirty (30) days
   2. The proposed lighting is designed in such a manner as to minimize light pollution as much as is feasible
   3. The proposed lighting will comply with the general intent of this Bylaw
   4. The permit will be in the public interest
2. The Council shall rule on the application within fifteen (15) business days from the date of submission of the request and notify the applicant in writing of his or her decision. The Council may grant one (1) renewal of the permit for an additional thirty (30) days if he or she finds that, because of an unanticipated change in circumstances, a renewal would be in the public interest. The Municipality is not authorized to grant more than one temporary permit and one renewal for the same property within one calendar year.

6. PERMITS AND DEVELOPMENT PLAN REVIEWS
Whenever a person is required to obtain a building or electrical permit for outdoor lighting or signage, a Conditional Use Permit, subdivision approval or any development plan approval by the Municipality, including all Municipal projects, or whenever a person requests annexation or rezoning, the applicant shall, as a part of said application, submit sufficient information to enable the Designated Official to determine whether the proposed lighting will comply with this Bylaw. All applications may be subject to review and action by the Panning and Development Committee at the discretion of the Designated Official.

All applications shall include the following:

a. Site plan indicating the proposed location of all outdoor lighting fixtures
b. A description of each illuminating device, fixture, lamp, support and shield. This description may include, but is not limited to, manufacturers catalog cuts and drawings (including sections where required), lamp types and lumen outputs
c. Such other information as the Designated Official may determine is necessary to ensure compliance with this Bylaw

d. If the Designated Official determines that the proposed lighting does not comply with this Bylaw, the permit shall not be issued or the plan approved

7. VARIANCES

Any person desiring to install an outdoor lighting fixture in violation of this Bylaw may apply to Council for a minor variance from the regulation in question. Such variances shall be allowed only as provided by the Minor Variance Committee.

8. NONCONFORMING USES

1. Mercury vapor lamps in use for outdoor lighting on the effective date of this Bylaw shall not be so used after third reading and passage of the Bylaw, April 11, 2006

2. Bottom or side-mounted outdoor advertising sign lighting shall not be used after third reading and passage of the Bylaw, April 11, 2006

3. No outdoor lighting fixture or use which was lawfully installed or implemented prior to the enactment of this Bylaw shall be required to be removed or modified except as expressly provided herein; however, no modification or replacement shall be made to a nonconforming fixture unless the fixture thereafter conforms to the provisions of this Bylaw, except that identical lamp replacement is allowed

4. Outdoor lighting fixtures installed or implemented prior to the enactment of this Bylaw should install deflectors that result in directing the light on their own property

5. In the event that an outdoor lighting fixture is abandoned or is damaged to the point of requiring repairs for safe operation, the repaired or replacement fixture shall comply with the provisions of this Bylaw

9. GENERAL REQUIREMENTS REGARDING INSTALLATION OF OUTDOOR LIGHT FIXTURES

Shielding

1. Except as provided in Subsection 9.2, no person shall erect, install, or use, or permit to be erected, installed or used, an outdoor light fixture which is not shielded.

2. The following outdoor light fixtures are not required to be shielded:

   a. outdoor light fixtures which are luminance tube lighting containing neon, argon or krypton

   b. outdoor light fixtures illuminating building entrance or exit doorways where such fixtures are incandescent fixtures with each fixture having light sources totaling not more than 150 watts and provided that there are not more than two fixtures lighting each entrance or exit doorway

   c. outdoor light fixtures used exclusively for and in connection with the television broadcasting of events at Outdoor Recreational Facilities, but only while the television broadcasting is being carried on

   d. outdoor light fixtures used exclusively for and in connection with the production of movies or commercials, but only while production is being carried on and provided
that any permits required from the Corporation or any other governmental authority for the production of such movies or commercials have been obtained.
e. outdoor light fixtures used exclusively for and in connection with the presentation of concerts, plays or other non-athletic entertainment events in parks or on other lands owned by the Corporation and used for public purposes.

3. Where outdoor light fixtures are required to be shielded, no person shall erect, install or use, or permit to be erected, installed or used, an outdoor light fixture, which is not of a design which allows the direction of light projection to be modified after installation unless the outdoor light fixture is shielded in all possible configurations of the fixture.

10. GENERAL REQUIREMENTS REGARDING INSTALLATION OF OUTDOOR LIGHT FIXTURES
1. Except as provided in Subsection 5.2, no person shall erect, install or use or permit to be erected, installed or used a lamp or an outdoor light fixture which includes or is designed to include a lamp which is of a type other than the following:
   a. incandescent;
   b. low pressure sodium;
   c. high pressure sodium;
   d. carbon arc
   e. halogen; or
   f. mercury vapor sources shall be prohibited.
2. The provisions of Subsection 10.1 do not apply as follows:
   a. to lamps or outdoor light fixtures that illuminate areas used for the outdoor display of merchandise for sale, provided that the applicable zoning bylaw and other applicable law permits such outdoor display of merchandise;
   b. to lamps or outdoor light fixtures lighting outdoor recreational facilities located 500 meters (1,640 ft.) from any navigable waterway, with the exception of the Municipal pavilion and community centre at the corner of Hwy. 124 and Church Street in the Village of Dunchurch.

11. PROHIBITIONS
1. Outdoor floodlighting by flood light projection above the horizontal is prohibited.
2. All light fixtures, which are required to be shielded shall be installed in such a manner that the shielding complies with the definition of fully shielded fixtures.
3. All light fixtures, including security lighting, except street lamps, shall be aimed or shielded so that the direct illumination shall be confined to the property boundaries of the source. Particular care is to be taken to assure that the direct illumination does not fall onto or across any public or private street or road. Motion sensing lighting fixtures shall be properly adjusted, according to the manufacturers instructions, to turn off when detected motion ceases.
4. No new mercury vapor light fixtures or replacement equipment other than bulbs shall be sold or installed for use as outdoor lighting within the Municipality after the effective date of this Bylaw, and the use of mercury vapor light fixtures for outdoor lighting is prohibited after third reading and passage of the Bylaw, April 11, 2006.
5. Search lights, laser source lights, strobe or flashing lights, motion or illusion lights or any similar high-intensity light shall not be permitted, except in emergencies by police and fire personnel at their direction or as permitted in subsection 9.1.2
6. Class 1 lighting, including but not limited to, sales, service, commercial, assembly, repair, maintenance, and industrial areas, may only continue in operation until 10:00 p.m., or for as long as the area is in active use. This provision is not applicable to fixtures lawfully installed or implemented prior to the adoption of the Bylaw.
7. Class 2 lighting shall have no time restrictions except as specified by Council for new projects
8. Class 3 lighting, except for flag pole lighting, must be extinguished after 10:00 PM or when the business closes, whichever is later, except that low-wattage holiday decorations may remain on all night from November 15 to January 15
9. Multi-class lighting, except for security lights, must conform to the time limitations of the most strict class
10. Lighting, in all cases, for all outdoor athletic fields, courts, tracks or ranges shall be considered Class 1. Lighting allowed in this subsection shall be subject to approval of the Planning and Development Committee. All events shall be scheduled so as to complete all activity by 10:00 PM. Illumination of the playing field, court, track or range shall be permitted after 10:00 PM only to conclude a scheduled event that was unable to conclude before 10:00 PM due to unusual circumstances. Fully Shielded lighting shall be required for fields designed for amateur, recreational or non-professional sports activity. For professional level sports facilities where fully shielded fixtures are not utilized, acceptable luminaries shall include those which are
   a. provided with internal or external glare control louvers, or both, and installed so as to minimize upward shining light and offsite light trespass as required
   b. installed and maintained with aiming angles that permit no greater than two percent (2%) of the light emitted by each fixture to project above the horizontal
11. Lighting for outdoor display lots shall be considered Class 1 except as follows:
   a. All such lighting shall utilize fully shielded luminaries that are installed in a fashion that maintains the fully-shielded characteristics
   b. Lighting allowed in this subsection shall be subject to approval of the Planning and Development Committee
12. Lighting for service station or similar canopies shall be considered Class 1 lighting. All luminaries shall be flush with the lower surface of canopies and utilize flat glass or plastic covers. The total light output used for illuminating service station canopies, defined as the sum of under-canopy initial bare-lamp outputs in lumens, shall not exceed forty (40) lumens per square foot of canopy. All lighting mounted under the canopy except internally illuminated signs, shall be included in the total. Fifty percent (50%) of the lumen output of all lamps mounted within or under a canopy, except internally illuminated signs, is included in the lumen caps in subsection 11.17
13. Lighting used for all externally illuminated signs shall conform to all restrictions of this Bylaw, shall be fully shielded, and shall be turned off at 10:00 PM or when the business closes, whichever is later
14. Outdoor internally illuminated advertising signs shall either be constructed with an
opaque background and translucent letters and symbols or with a colored (not white, cream, off-white, yellow or other light color) translucent background, with either translucent or opaque letters and symbols. Opaque means only that the material must not transmit light from the internal illumination source: the color of such opaque backgrounds is not restricted by this section. Lamps used for internal illumination of such signs shall not be included in the lumens per net acre limit set in subsection 11.17. All illuminated signs shall be turned off at 10:00 PM or when the business closes, whichever is later.

15. All outdoor neon lighting shall be fully shielded and shall be turned off at 10:00 PM or when the business closes, whichever is later.

16. The shielding/use code for lamp source and shielding of light emissions for outdoor light fixtures are as follows:

<table>
<thead>
<tr>
<th>Lamp Type</th>
<th>Shielding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1, 2 and 3 lighting above 2050 lumens</td>
<td>F (see Note 1)</td>
</tr>
<tr>
<td>Class 1, 2 and 3 lighting below 2050 lumens</td>
<td>A (see Note 2)</td>
</tr>
<tr>
<td>All types below 2050 lumens</td>
<td>A</td>
</tr>
<tr>
<td>All neon tube lighting</td>
<td>F</td>
</tr>
<tr>
<td>Lamps in motion sensing security lights</td>
<td>A</td>
</tr>
</tbody>
</table>

Note 1. Examples of lamp types of < 2,050 lumens are listed below (the acceptability of a particular light is decided by its lumen output, not wattage--check manufacturer’s specifications):

1. 100 Watt standard incandescent and less
2. 100 Watt mid-break tungsten-halogen (quartz) and less
3. 25 Watt T-12 Cool White Fluorescent and less
4. 18 Watt low pressure sodium and less

Note 2. Lights shall be shielded whenever feasible to minimize light spilled into the night sky or adjacent properties. Unshielded lights (all types) are limited to a maximum of 5,500 lumens per net acre. Residential parcels and development projects containing one net acre or less are allowed 5,500 lumens of unshielded light (all classes).

12. MOUNTING HEIGHT

1. Parking Lot Lighting Standards: Lighting standards (poles) shall be sized in such a manner that the top of any luminary does not exceed .6 meters (19 ft. 8 inches) above adjacent grade, unless otherwise specified by the Planning & Development Committee for new projects.

2. Residential Standards: Except as provided in Subsection 6.2, no person shall erect, install or use or permit to be erected, installed or used an outdoor light fixture at a mounting height above the following height:
   a. 4.5 meters (14.76 ft.) above grade. Concrete pedestals shall not exceed .6 meters (24 inches) and shall be included in the overall height. Building mounted fixtures shall be located below the roof eaves and not exceed the height of the pole mounted fixture 4.5 meters (14.76 ft.) whichever is lower.
b. Mounting height refers to the height of the lamp, or the highest of the lamps if there is more than one lamp, forming part of the outdoor light fixture.

3. There is no restriction on the mounting height of outdoor light fixtures lighting outdoor recreational facilities or streets.

13. AUTOMATIC TIMING DEVICES
1. No person shall erect, install or use or permit to be erected, installed or used, outdoor light fixtures in conjunction with uses described in section 3.1 unless a sufficient number of such outdoor light fixtures are equipped with automatic timing devices, which turn off outdoor light fixtures between 11:00 p.m. and sunrise the following day to satisfy the requirements of section 11.

2. The owners of real property on which outdoor light fixtures have been equipped with automatic timing devices shall maintain the automatic timing devices in good state of repair and replace any automatic timing devices which are damaged, destroyed or removed.

14. FIXTURE TYPE AND MOUNTING
1. Directional Lighting: Spot and flood lighting of walkways, driveways, yards and buildings are limited to a maximum of two fixtures of no more than 150 watts each and with a directional angle of no more than 30 degrees from a downward vertical axis and not directly illuminating any areas within 5 meters (16.4 ft.) of the side and rear property lines and 15 meters (49.2 ft.) of the front property line.

2. Fixture Type: For building mounted fixtures, the designated official shall insure that the proposed fixture type will be in scale with the building elevation on which it is to be installed. The Chief Building Official may refer this latter determination to the Planning & Development Committee.

3. Spacing of Fixtures: The distance separating lights shall be no less than 10 meters (32 ft. 9 inches).

4. Shielding: Where light fixtures are adjacent to residential properties, lighting fixtures shall by use of fixture cutoffs and/or use of optically controlled fixtures to eliminate light spillover and glare or directional aiming so as not to trespass beyond the 5 metre (16.4 ft.) set back from property lines, except as elsewhere permitted in this Bylaw.

5. Luminance: Minimum lighting shall meet the requirements for safely navigating walkways, sidewalks, driveways and activity areas. Furthermore said light shall be directed in such a manner that any changes in evaluation of the walkway (i.e. steps or curbs) shall be illuminated such that said features are clearly discernible (without shadow).

15. ARCHITECTURAL AND LANDSCAPE LIGHTING
1. The use of architectural or landscape lighting to highlight the unique features of a building and/or surrounding landscape treatment may be considered during the development review process. In order to consider whether such lighting should be approved, the following procedures and criteria have been prepared to assist in the consideration of such applications:
   a. Architectural and landscape lighting. The consideration and approval of said
type lighting shall be reviewed and approved by the designated official. The designated official in considering such architectural and landscape highlighting shall determine whether the lighting satisfies the criteria in subsections b. through e.

b. The lighting will illuminate an architectural feature or landscape feature that is unique to the particular project due to the use of materials, colors, or design characteristics which are not commonly found within the Municipality

c. The architectural lighting proposal will enhance the design of a project and is not solely used as an attraction getting device

d. Location of fixtures. Highlighting fixtures may be located either on the building, on adjacent ground, and on ornamental standards. These fixtures are to be arranged such that they are not generally visible from the public

e. Shielding for glare. Highlighting fixtures should be located and designed in such a manner that the actual lamp and reflector are shielded or louvered so that it is not seen from a normal public viewing area. It is especially important in areas where there is considerable vehicle and pedestrian traffic that direct glare be avoided

1. Exposed string lighting regulations--exposed string lighting is permitted subject to the following provisions:

a. Exposed string lighting shall be defined as low wattage lights with individual bulb receptacle connected by electrical wires that are exposed to the outside surface of a plant or building feature, more specifically said lights shall be defined as a commercially available maximum 2.8 watt system, designed for exterior installation and use. Lights which are blinking or chasing are not permitted.

b. Temporary exposed seasonal string lighting shall be permitted without permit during the period between the third Saturday of November and New Year’s Day. Said lighting fixtures are to be removed by January 8th of each year.

c. Permanently exposed string lights are permitted in the CG (General Commercial), CT (Tourist Commercial), FM (Farm Market), and the CN (Neighborhood Commercial) Districts subject to the approval by the Planning Director provided that all of the following criteria are satisfied:

1. Exposed permanent string lights shall be exclusively a white light with a clear bulb and are limited to the lighting of living landscape features (trees) if used in combination with other highlighting or pedestrian lighting fixtures within the immediate area

2. Exposed string lights shall be limited to designated outside dining or display areas and main pedestrian entry to a project site

3. Said lighting fixtures shall require an electrical permit for installation and shall be secured to the landscape feature with bands that will not puncture the skin of the plant

4. Applications for such lighting shall be limited to one per project and shall not involve an area greater than five (5) percent of the building square footage of a center/plaza nor more than fifteen (15) percent for a free-standing commercial building not part of a commercial center or plaza

5. Approval of applications shall be made by the designated official upon satisfactory compliance with the limitations and design parameters above. Said approval shall be
conditioned to include compliance with all other applicable laws including Zoning Bylaws. Failure to properly maintain the lights shall be subject to removal of said fixtures.

d. Applications for exposed string lights that are not consistent with the provisions of subsection a to c above shall be subject to the review and approval of the Planning and Development Committee.

16. DUCK AND BOATHOUSE LIGHTING

1. Pathway, dock and boathouse lighting shall not exceed 0.5 meters (1 ft. 7 inches) in height above the pathway, dock or boathouse deck surface if mounted on the decking and shall have no greater illumination than 40 watts per fixture and be equipped with a shroud to deflect the light below the horizontal elevation. Spacing of such fixtures shall not be less than 3 meters (9 ft 10 inches) from each other in any direction and not directly illuminating any areas within 5 meters (16.4 ft.) of the side and rear property lines.

2. No interior mounted light source within a boathouse shall be directed to the exterior through glazing or openings and shall be shielded to deflect the light below the horizontal elevation or in a manner that shields direct light emitting exposure of the fixture to the exterior. Exterior wall mounted boathouse lighting shall not exceed more than 2.5 meters (8 ft. 2 inches) above the boathouse main level deck surface or 2 meters (6.56 ft.) above the second level deck surface and be equipped with a light diffuser and fully shielded to deflect the light below the horizontal elevation. Equipped with a timer set no earlier than 6:00 a.m. and no later than 10:00 p.m. or a motion detector.

17. HOURS OF OPERATION

1. Turning Off Outdoor Light Fixtures: All owners of property on which outdoor light fixtures are erected, installed or used in conjunction with the uses shall ensure that those outdoor light fixtures are turned off between 11:00 p.m. and sunrise (unless otherwise noted in this Bylaw) the following day except as follows:

   a. outdoor light fixtures may remain on to illuminate outdoor areas for security, or safety purposes provided all other requirements of this Bylaw are met.
   
   b. where an outdoor recreational use in an outdoor recreational facility continues after 11:00 p.m., Outdoor light fixtures required to be on in connection with that use are permitted, but only while that use continues;
   
   c. where a concert, play or other entertainment event in a park or on other lands owned by the Municipality and used for public purposes takes place or continues after 11:00 p.m., Outdoor light fixtures required to be on in connection with that event are permitted, but only while the event takes place or continues; and
   
   d. in an area which is used for commercial, industrial or institutional uses where such uses are carried on after 11:00 p.m. and personnel relevant to such uses are working on the premises, Outdoor light fixtures required to be on in connection with such uses are permitted, but only while such uses are carried on.
18. REPLACING EXISTING OUTDOOR LIGHT FIXTURES

1. Existing Outdoor Light Fixtures
   a. Except as provided in paragraphs (b) and (c), outdoor light fixtures existing and installed on a lot prior to the effective date of this Bylaw are exempt from the provisions of this Bylaw save and except the provisions of Part 17—hours of operation
   b. No person shall modify or permit to be modified an outdoor light fixture including an existing outdoor light fixture in a way which changes that fixture from a fixture which is shielded to a fixture which is not shielded or from a fixture which satisfies the requirements of this Bylaw to a fixture which does not satisfy those requirements
   c. Where an owner constructs a building on a lot which is used or intended to be used for one or more purposes and on which there are existing outdoor light fixtures
      1. in conjunction with that construction, replaces 50% or more of the existing outdoor light fixtures on the lot or increases by 50% or more the number of outdoor light fixtures existing on the lot immediately prior to the effective date of this Bylaw, the owner shall ensure that all outdoor light fixtures on that lot, including existing outdoor light fixtures, comply with all of the provisions of this bylaw and if existing outdoor light fixtures are required to be replaced or modified to achieve compliance, the owner shall replace or modify those existing outdoor light fixtures

19. PLANS AND DOCUMENTS

1. Where a person
   a. proposes to lay out and establish a commercial parking lot or proposes to construct a building on a lot used or intended to be used for one or more purposes
   b. proposes to install or erect outdoor light fixtures in conjunction with such commercial parking lot or building
   c. that person shall file with the designated official a lighting plan together with related documents and information to satisfy the designated official that the proposed lighting will comply with the provisions of this Bylaw

2. The Submission shall contain, but shall not be limited to the following:
   a. plans indicating the following:
      1. the location of all buildings and structures on the property
      2. the location, number, type, position, elevation and mounting height of all outdoor light fixtures
      3. the number and location of outdoor light fixtures to be equipped with automatic timing devices; and
      4. any building design or other features which may affect the nature, intensity or direction of light emission from outdoor light fixtures
   b. description of and background information regarding all outdoor light fixtures, including the following:
      1. power (in watts)
2. type of light source
3. filtering, if any
4. information evidencing whether or not outdoor light fixtures are shielded
5. information as to light distribution in the horizontal and vertical phase planes
6. information as to light distribution in the horizontal plane between 11:00 p.m. and sunrise the following day
7. manufacturer’s catalogue information and drawings; and
   c. information regarding the design capability of the outdoor light fixture to permit any change in the items referred to in paragraphs (a) and (b)

3. The above required plans and descriptions shall be sufficiently complete to enable the designated official to readily determine whether the requirements of this Bylaw will be complied with
   a. The Chief Building Official shall not issue a building permit for any construction in respect of which a lighting requirements is required pursuant to Ontario Building if the requirements have not been met and approved by the Designated Code Official
   b. When a lighting plan is required to be filed under this Bylaw in connection with the laying out and establishment of a commercial parking lot, Council of the Municipality or its Designated Official for granting site plan approval shall refuse to grant site plan approval for such development if the required lighting plan has not been filed and approved by the designated official

4. No person shall commence construction of any development referred to in Subsection 19.1.1. until the lighting plan has been filed and approved by the designated official or the Planning and Development Committee.

5. Where an approved lighting plan is required, no person shall erect or install, or permit to be erected or installed, outdoor light fixtures except in accordance with the approved lighting plan or a change application approved in accordance with paragraph (19.1.6)

6. If there is an approved lighting plan in place and a person proposes to modify the approved lighting plan or to install outdoor light fixtures otherwise than in accordance with the approved lighting plan (including any change in the type of lamp shown on the approved plan) the applicant shall submit a change request to the designated official together with adequate information to evidence compliance with the requirements of this Bylaw

20. COMPLIANCE ALTERNATIVES AND ADMINISTRATIVE EXEMPTIONS

1. The provisions of this Bylaw are not intended to prevent the use of any design, material or method of installation not specifically prescribed by this Bylaw, provided any such alternate design, material or method of installation has been approved by the Designated Official. The Designated Official may approve any such proposed alternative provided that he or she finds that the following:
   a. provides at least approximate equivalents to the applicable specific requirements of this Bylaw
   b. is otherwise satisfactory and complies with the intent of this Bylaw

2. Administrative Exemptions: Council of the Municipality may grant an exemption or minor
variance from some or all of the provisions of this Bylaw upon the application of any Person if in the opinion of Council, compliance with the Bylaw is impracticable and the general intent and purpose of the Bylaw are maintained

3. If the request for an exemption or minor variance is approved by council, a written record of the request and approval shall be kept by the Municipality and shall be open to public inspection

21. INSPECTION AND OFFENCES

1. Inspectors
   1. All Bylaw Enforcement Officers hereby are appointed inspectors for the enforcement of this Bylaw

2. Entry
   1. For the purpose of determining whether there is compliance with this Bylaw, an inspector may have access to or enter any land, building or structure governed by this Bylaw between the hours of 8:00 am and 6:00 p.m. and may conduct an inspection
   2. No inspector may enter a building or structure that is also a dwelling without the consent of the occupant or without first obtaining and producing a warrant
   3. An inspector conducting an inspection shall produce identification issued by the clerk of the Municipality upon request

3. Powers on Inspection
   1. Any inspector conducting an inspection may inspect the land, Building or structure and may question a person on matters relevant to the inspection
   2. No person shall hinder or obstruct an inspector lawfully conducting an inspection under this Act

4. Application for Warrant
   1. An inspector may apply to a Justice of the Peace for a warrant if
      a. the inspector has been denied access or entry to any land, building or structure
      b. the inspector has been instructed or directed to leave any land, Building or structure
      c. the inspector has been obstructed in the conduct of the inspection

5. Offence and Penalty
   1. Whenever in this Bylaw there is a duty imposed upon any person and such person fails to perform such duty, such person is guilty of an offence under this Bylaw and upon conviction is liable to a maximum fine as established pursuant to the Provincial Offences Act, or any successor legislation
   2. Without limiting any other provision of this Bylaw and in addition thereto, any person who otherwise contravenes the provisions of this Bylaw is guilty of an offence and upon conviction is liable to a maximum fine as established pursuant to the Provincial Offences Act, or any successor legislation
22. MISCELLANEous

1. Citation
   1. This Bylaw may be cited as the Light Pollution Bylaw. Notwithstanding any other provisions in this Bylaw, nothing in this Bylaw shall have the effect of requiring outdoor lighting, which provides a lower level that would endanger public safety or security.

23. General

1. The division of this Bylaw into parts, sections, subsections, paragraphs and subparagraphs and the insertion of headings are for convenience of reference only and shall not affect the construction or interpretation of this Bylaw.

2. If any provision of this Bylaw or the application thereof to any person or circumstance is invalid, this invalidity shall not affect other provisions or application of this Bylaw which can be given effect without the invalid provision or application, and to this end the provisions of this Bylaw are severable.

3. Upon receipt of a complaint, Council recommends that the Bylaw Enforcement Officer provide information to the owner of the Light Pollution Bylaw and suggest ways and means to address the complaint.

24. Effective Date

1. This Bylaw shall come into effect upon third reading and passage of the Bylaw.
Appendix C: Township of Central Manitoulin By-Law #2003-16

Township of Central Manitoulin
Outdoor Lighting Control and Dark Sky By-law
BY-LAW #2003-16

WHEREAS, unnecessary and improperly designed light fixtures cause glare, light pollution and wasted resources; and,

WHEREAS, glare and light pollution can result in: hazardous circulation conditions for all modes of transportation; the diminishing ability to view the night sky; light trespass; and, unattractive townscape; and

WHEREAS, the citizens of the Township of Central Manitoulin value the natural environment, including the beauty and high quality of the night sky; and,

WHEREAS, the Township of Central Manitoulin desires to protect the health, safety and welfare of the general public (residents, tourists and motorists), and to protect the integrity of our dark night sky that adds to the quality of life, economic well being and community identity of the Municipality; and,

WHEREAS, these regulations for exterior lighting will not sacrifice the safety of our citizens or visitors, or the security of property, but instead will result in safer, efficient and more cost-effective lighting.

NOW THEREFORE, BE IT RESOLVED, “that the Township of Central Manitoulin hereby enacts this by-law in support of the National Dark Sky Sanctuary designation”. CARRIED.

Section 1. Short Title

This by-law together with future amendments may be cited as the “Outdoor Lighting Control and Dark Sky By-law”.

Section 2. Purpose

2.1 The general purpose of this by-law is to protect and promote public health, safety and welfare, quality of life, and the ability to view the night sky, by establishing regulations and a process of review for exterior lighting. These lighting standards for exterior lighting are intended to accomplish the following:

2.1.1 To protect against direct glare and excessive lighting (light pollution);

2.1.2 To protect and reclaim the ability to view the night sky, and thereby help preserve the quality of life and this area as a National Dark Sky Sanctuary;

2.1.3 To prevent light trespass in all areas of the Municipality;
2.1.4 To promote efficient and cost effective lighting;

2.1.5 To ensure that sufficient lighting can be provided where needed to promote safety, visibility and security for the properties, businesses and rights of way within the Municipality;

2.1.6 To provide assistance to property owners and occupants in bringing new, and existing non-conforming lighting into conformance with this by-law; and,

2.1.7 To work with other jurisdictions throughout Manitoulin Island to meet the purposes of this by-law.

Section 3. Definitions

3.1 As used in the Outdoor Lighting Control and Dark Sky By-law:

3.2 Fully Shielded means that fixtures are shielded in such a manner that light rays emitted by the fixture, either directly from the bulb or indirectly from the lens or fixture, are completely restricted to regions below an angle 15 degrees beneath the horizontal plane running through the lowest point on the fixture.

3.3 Partially Shielded means that fixtures are shielded or constructed so that no more than ten percent of the light rays emitted by the fixture either directly from the bulb or indirectly form the fixture, project above the horizontal plane running through the lowest point on the fixture.

3.4 Glare means light emitting from a luminaire with an intensity great enough to reduce visibility, and in extreme cases, may cause momentary blindness.

3.5 Bulb means the source of electric light.

3.6 Fixture means the assembly that holds the lamp in a lighting system. It includes the elements designed to give light output control, such as a reflector (mirror) or refractor (lens), the ballast, housing and the attachment parts.

3.7 Existing lighting means any and all lighting installed prior to the effective date of this by-law.

3.8 Full cut-off fixtures means fixtures that do not allow light to escape above an eight-five (85) degree angle measured from a vertical line from the centre of the bulb extended to the ground (see Appendix A, also see 3.2 fully shielded).

3.9 Exterior Lighting means temporary or permanent lighting that is installed, located or used in such a manner to cause light rays to shine outside or in areas not enclosed by a
structure. Fixtures that are installed indoors that are intended to light something outside are considered exterior lighting for the intent of this by-law.

3.10 Light means the form of radiant energy acting on the retina of the eye to make sight possible; brightness; illumination; a lamp or fixture as defined above.

3.11 Light Trespass means light falling where it is not wanted or needed generally caused by a light on a property that shines onto the property of others.

3.12 Light Pollution means any adverse effects of manmade light including, but not limited to, light trespass, uplighting, the uncomfortable distraction to the eye, or any manmade light that diminishes the ability to view the night sky; often used to denote urban sky glow.

3.13 Uplighting means lighting that is directed in such a manner as to shine light rays above the horizontal plane.

**Section 4. Application**

4.1 All outdoor lighting fixtures shall be fully shielded and of the full cut-off type of fixture. A fixture installed as part of a structure may be considered fully shielded if the structure rather than the fixture itself provides the required restriction of light rays.

4.2 Lighting fixtures shall be shielded and/or directed in such a manner that they illuminate only the area intended and do not spill over into neighboring areas so as to interfere with the peaceful enjoyment of residential or public properties.

4.3 The use of Metal Halide, Mercury Vapour and Quartz outdoor lighting is prohibited within the boundaries of the Municipality after dark.

4.4 All architectural or decorative lighting shall be turned off between 2300 hours and sunrise (see exemptions).

4.5 No lighting shall be installed higher than 9.2 metres above grade, except lighting for recreational playing fields provided that all other provisions of this by-law are met; and, except street lights used on major roads may exceed this restriction if deemed necessary by Municipal Council, as advised by a lighting engineer.

4.6 No outdoor recreation facility shall be illuminated after 2300 hours, except to conclude any recreational or sporting event, or other activity in progress prior to 2300 hours.

4.7 Outdoor advertising signs; lighting fixtures used to illuminate an outdoor advertising sign shall be;

   4.7.1 Mounted on top of the sign and be in compliance with other sections of this by-law or;
4.7.2 Signs may be illuminated from within provided they are constructed with an opaque background and translucent text and symbols, or with a coloured background (not white, off white, light gray, cream or yellow) and generally lighter text and symbols.

Section 5. Exemptions

5.1 All luminaries lawfully in place prior to the adoption of this by-law shall be grandfathered and exempted from the provisions of this by-law. However, any luminaire that replaces a grandfathered luminaire, or any grandfathered luminaire that is moved or modified must meet the standards of this by-law.

5.2 Sensor activated lighting may be left unshielded provided it is located in such a manner as to prevent direct glare and lighting the properties of others or into a public right of way, and provided the light is set to only go on when activated and to go off within five minutes after activation has ceased, and the light shall not be triggered by activity off the property.

5.3 Vehicular lights and all temporary emergency lighting needed by the Fire and Police departments, or other emergency services shall be exempt from the requirements of this by-law.

5.4 Nothing in this by-law shall apply to navigational lighting systems at lighthouses and airports, nor to airport lighting systems marking runways or taxiways. All radio, communications and navigation towers that require lights shall have dual lighting capabilities. For daytime, white strobe lights may be used, and for nighttime, only red lights shall be used.

5.5 Outdoor lighting fixtures on residential properties with incandescent lamps equal to or less than 100 (one hundred) watts are exempt from the requirements of this by-law. However, owners are encouraged to use fixtures with opaque tops to prevent light from going directly up.

5.6 Decorative outdoor lighting fixtures typically with bulbs less than 25 watts, such as holiday lighting installed seasonally are exempt from the requirements of this by-law.

5.7 Outdoor lighting utilizing only fossil fuels, including torches, luminaries, lanterns and open flame devices are exempt from the requirements of this by-law.

Section 6. Penalties

6.1 If after investigation, the Municipality finds that any provision of this by-law is being violated, the administrator shall give notice by hand delivery or registered mail, return receipt requested, of such violation to the owner and/or occupant of the premises,
demanding that the violation be abated within thirty (30) days of receipt of notice of violation. The municipal staff, planning personnel or chief building official shall be available to assist in working with the violator to correct said violation. If the violation is not abated within the thirty-day period, the administrator may institute actions and proceedings to restrain or abate any violations of this by-law and to collect the penalties for such violations.

6.2 PENALTY—A violation of this by-law, or any provision thereof, shall be punishable by a civil penalty of one hundred dollars ($100), and each day of violation after the expiration of the thirty-day period provided in Subsection 6.1 above, shall constitute a separate offense for the purpose of calculating the civil penalty.

Section 7. Notification

7.1 The Municipality shall notify any person of the existence of this by-law prior to issuance of a building permit for any new construction or renovation project, which includes exterior lighting. The Municipality shall also provide a copy of Appendix A of this by-law, along with a copy of the Good Neighbor Outdoor Lighting leaflet to all persons receiving a building permit.