

# Assessment of proposed lighting plan for Roundhouse Parking Lot, Northampton, MA

Prepared by Northampton City Lights

## **Steering Committee:**

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## **Summary**

The proposed lighting for Northampton's Roundhouse Parking Lot would significantly increase the level of illumination, sky glow, harmful blue light, glare, and light trespass compared to current lighting. Some elements of the plan are technically allowed under Northampton's current lighting code §350-12.2. Overall, however, the lighting plan violates many of the underlying principles of the city's code. It also violates almost all of the Illuminating Engineering Society / International Dark-Sky Association Five Principles of Responsible Outdoor Lighting, which were unanimously endorsed by the Energy and Sustainability Commission in January 2021. The proposed lights are even brighter with worse glare than in nearby Pulaski Park, which itself suffers from overlighting, glare, and excessive harmful blue emission. The proposed lights would negatively impact the health and well-being of low-income residents in the adjacent McDonald House and 34 South Street, a serious social justice issue. They would also negatively impact the health of essentially all flora and fauna in the vicinity, including pollinating insects the city hopes to attract with a proposed pollinator garden. Strong glare would impair visibility especially for the elderly, causing road safety hazards as well as allowing would-be intruders to go undetected. For improved safety, visibility, public health, and environmental protection, the plan should be significantly improved to include illumination levels roughly 10x lower, using fixtures that are fully shielded against glare, only warm colors ideally 2200K, and timing controls to dim or turn off the lights late at night.

## **I. Goals of Northampton's lighting code**

Northampton code §350-12.2 (A) states:

### *Goals.*

*(1) It is the intent of this section to establish light standards that result in lighting systems that are designed, constructed, and installed to control glare and light trespass, minimize obtrusive light, conserve energy and resources while maintaining safety, visibility, security of individuals and property, and curtailing the degradation of the*

*nighttime visual environment. All standards within this section must be met unless the Planning Board explicitly grants a waiver through site plan approval for lighting that does not conform to these standards. Such waivers may be granted if and only if these goals are being achieved and increased energy efficiency is achieved.*

*(2) Evenly distributed lighting throughout a site will minimize impacts on surrounding neighborhoods and increases efficiency. By directing light where it is needed and only the intensity necessary to serve the intended purpose, these standards will prevent glare and its harsh shadows and blind spots.*

## **II. The IES/IDA Five Principles of Responsible Outdoor Lighting**

At its January 29, 2021 meeting, the Northampton Energy and Sustainability Commission unanimously endorsed the Five Principles of Responsible Outdoor Lighting outlined jointly by the Illuminating Engineering Society (IES) and the International Dark-Sky Association (IDA):

1. All light should have a clear purpose.
2. Light should be directed only to where needed.
3. Light should be no brighter than necessary.
4. Light should be used only when it is useful.
5. Use warmer color lights where possible (with default = 2200K)

The IDA recommends a values-based approach to outdoor lighting that takes full consideration of all five of the IDA/IES Principles of Responsible Outdoor Lighting:

<https://www.darksky.org/values-centered-lighting-resolution/>

## **III. Proposed Lighting Plan for Roundhouse Lot**

The lighting plan developed by Apex Lighting Solutions and provided by Project Manager Alex Fagnand of Tighe & Bond includes two kinds of fixtures. Both are Lumec MetroScape post-top LED luminaires (Fig. 1), the same as installed in Pulaski Park (and the police station and outside Bridge Street School) in 2016. The plan calls for:

- 17 luminaires each with 81 Watts and producing 6685 lumens and
- 5 luminaires each with 54 Watts and producing 4422 lumens
- Total of 135,755 lumens
- All fixtures are proposed to have “warm white” color, or correlated color temperature (CCT) = 3000K
- Luminaires mounted 18 feet above the pavement
- The illuminance levels on the property indicated on the plan range from 0.0 to 2.2 foot-

candles (fc), with an estimated average of 1.24 fc.

- The backlight/uplight/glare ratings for the two proposed fixture types are B3/U0/G2 and B1/U1/G1, respectively.



*Figure 1: Lumece MetroScape light fixture currently in Pulaski Park; same fixture is proposed for Roundhouse Lot.*

#### **IV. Comparison with existing lighting in Roundhouse Lot and in Pulaski Park**

Northampton City Lights, a group of residents of Northampton who are concerned about light pollution and its negative effects, has objected for several years to the new lights in Pulaski Park for several reasons. They are not only bluer than the 3000K maximum recommended by the American Medical Association. They are also much too bright, and much too poorly shielded against glare (Fig. 2). Those lights produce over 2 foot-candles of illumination at many parts of the park (for comparison, full moonlight is about 0.01 fc, or 200x less). That is much, much brighter than necessary for safety and visibility, which would be fine with 0.2 fc if glare were controlled. It is more than 10x times brighter than some public parks in New York City (e.g. the Highline; the East River Promenade; Figs. 3 and 4).



*Figure 2: Light fixtures in Pulaski Park, Northampton (MetroScape, 4000K, 37W, 3450 lumens) have similar design to fixtures in the current proposal for the Roundhouse Lot. These lights are excessively bright -- 10x brighter than lighting in some parks in New York City -- and cause significant glare. The proposed Roundhouse Lot lights would be up to 2x brighter with even more glare (3000K, 54-81W, 4400-6600 lumens). Note the pollinator garden, illuminated all night long with bright blue-rich light known to be harmful to insects including pollinators.*

The glare is very significant: all the lights are like a sharp poke in the eye seen even from across the street. A prominent award-winning lighting designer walked there a few years ago and was shocked at how bright and how poorly shielded against glare they were.

The lights in the current plan for the Roundhouse Lot are less blue, but are **even brighter, with worse glare**: In Pulaski Park, they're 37W, **3451** lumens, B3/U0/G1. The lights proposed for the Roundhouse Lot are 5 fixtures @ 54W, **4422** lumens, B1/U0/G1 and 17 fixtures @ 81W, **6685** lumens, B3/U0/G2 – nearly **twice the lumens** of the Pulaski Park lights, with more glare. While the Pulaski Park lights are a sharp poke in the eye, the proposed Roundhouse Lot lights would be a blinding blast as viewed from any street level location in sight of the parking lot.

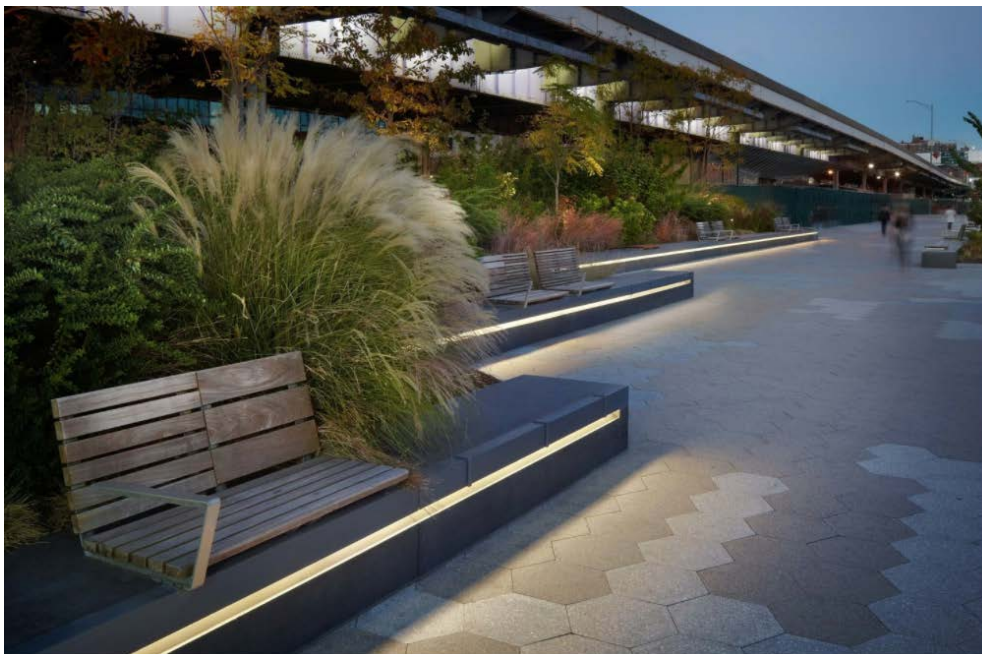
The photometric plan doesn't begin to capture that reality.

The current lights in the Roundhouse Lot (Fig. 5) are not dark-sky-friendly, with significant glare and uplighting, but at least there are only a few of them, and they provide **maximum illumination of only about 1.5 fc**. Many parts of the lot currently have **less than 0.05 fc**

**illumination.** We are not aware of any evidence showing that that illumination has been established as the cause of any risk to personal safety or property, from crime to tripping. On the contrary, there's much more than enough light now to see where you're going anywhere in the lot. To provide illumination levels even higher than 1.5 fc over most of the Roundhouse Lot as planned, the new lights would necessarily be much brighter, with much worse glare.



*Figure 3: The High Line park, New York City. Lighting is carefully designed to avoid glare and overlighting. The result is a warm, inviting ambiance with excellent visibility. The proposed Roundhouse Lot lights would be more than 10x brighter with much worse glare. (Source: Shutterstock)*



*Figure 4: East River Waterfront promenade, New York City. Illumination levels of 0.2 fc from well-designed lighting controlled against glare provides excellent visibility and safety. The proposed Roundhouse Lot lights would be 10x brighter with strong glare. (Source: Tillotson Design)*



Figure 5: Roundhouse lot with current lighting. Note apartment building at left, Pulaski Park center rear, and Roundhouse at right. Current light levels range from about 1.5 fc directly underneath post-top lights to less than 0.05 fc. Proposed lighting would increase illumination levels virtually everywhere in the parking lot, with significant glare and light trespass into neighboring residences.

## V. Assessment of compliance with Northampton lighting code

### Glare and light trespass

Northampton code §350-12.2 (C) states in part:

*All outdoor light fixtures and illuminated signs for all uses and structures within the City of Northampton shall be designed, located, installed and directed in such a manner as to prevent measurable light at the property lines and glare at any location on or off the property....Lighting shall be shielded to prevent direct glare and light trespass and shall be contained to the target area to the extent feasible.*

Most of the proposed fixtures have glare ratings G3, meaning very high glare would be visible both on and off the property. Light trespass into neighboring apartments would be significant and a serious health and quality of life issue for residents. This is in **violation** of the city's code.

### Full cutoff fixtures

Northampton code §350-12.2 (C)(1) states in part:

*All outdoor lighting shall have full cutoff-type fixtures... Cutoffs shall shield bulbs from visibility and may consist of internal baffles or reflectors or external panels or other mechanisms.*

The proposed MetroScape fixtures produce zero direct uplighting into the sky, which is good. However, they have no mechanism to shield the LEDs themselves from visibility by anyone in the vicinity of the site. As in Pulaski Park, the unshielded LEDs would be an unnecessarily painful, annoying, and hazardous source of disability glare, or light shining directly from the light source into the viewer's eye that impairs visibility. This is in **violation** of the city's code.

### **Illumination levels**

Northampton code §350-12.2 (C)(6) states in part that for Central Business zoning district (which includes the Roundhouse Lot), illumination levels up to maximum 5 foot-candles with site average of 2.0 fc are permitted. The proposed lighting plan technically satisfies this requirement.

However, the stated goals of the city's lighting code – *“to control glare and light trespass, minimize obtrusive light, conserve energy and resources while maintaining safety, visibility, security of individuals and property, and curtailing the degradation of the nighttime visual environment”*, and to seek lighting that *“will minimize impacts on surrounding neighborhoods and increases efficiency. By directing light where it is needed and only the intensity necessary to serve the intended purpose, these standards will prevent glare and its harsh shadows and blind spots”* -- are clearly **violated** by the proposed lighting plan. There is no reasonable justification for illuminating an entire parking lot to levels of 1.0-2.0 fc with high glare when illumination levels of 0.1-0.2 fc using fixtures with full control of glare would not only suffice but would provide better visibility and safety. No consideration seems to have been given to the health and well-being of surrounding neighborhoods or the nighttime visual environment.

## **VI. Assessment of compliance with IES/IDA Five Principles of Responsible Outdoor Lighting**

- 1. All light should have a clear purpose:** The purpose of the Roundhouse Lot lighting is presumably safety from tripping hazards and from crime. While some lighting is appropriate, neither concern is well served by the current plan.
- 2. Light should be directed only to where needed:** The high level of glare from the proposed lights means light is not going where it is needed, but sideways into motorists' eyes and neighbors' windows.
- 3. Light should be no brighter than necessary:** 10x lower illumination levels would be more than bright enough (e.g. Smith College parking lots).
- 4. Light should be used only when it is useful:** The current plan calls for lights to be on at full intensity all night long, whether they're needed or not. Dimmers and timers should be employed on all the Roundhouse Lot lights to turn them off or down late at night when almost everyone is asleep at home.

**5. Use warmer color lights where possible** (with default = 2200K): The current plan of 3000K LEDs is at the very blue limit recommended by the AMA and the IDA and is rapidly becoming obsolete. The most commonly requested CCT for streetlight retrofits in Massachusetts is now 2700K, with 2200K currently planned for Pepperell, Rockport, and Nantucket.

## **VII. Negative impacts of proposed lighting**

The proposed lighting would have significant negative impacts on all nearby residents, visitors to the lot, and the natural environment. For complete references on these effects, mostly in peer-reviewed scientific journals, see the recent report to the United Nations by the Dark & Quiet Skies Conference: <https://www.iau.org/news/announcements/detail/ann21002/>

### **Human health**

Artificial light at night (ALAN) is associated with serious negative impacts on human health, including suppression of melatonin production, elevated rates of cancer, diabetes, obesity, depression, and sleep disruption. The proposed outdoor lighting would be plainly visible at night, either directly from fixtures or reflected from buildings, pavement, and vegetation, to most or all residents from inside their apartments, and would negatively impact their health and well-being unless they install blackout shades. Homeless people and apartment residents on a tight budget or lacking access to public health information may lack the means or ability to protect themselves with blackout shades, and are thus vulnerable to disruptive and harmful light all night every night.

The proposed 3000K lights are too blue -- they're hard on the eyes, but more importantly they have 18-25% of their emission in the blue part of the spectrum (405-530 nm), where they cause suppression of melatonin in humans and other vertebrates. 2200K LEDs with excellent efficacy in lumens/watt and excellent color rendition index (CRI) are available from numerous suppliers. They're being demonstrated right now in Pepperell MA and soon in Rockport MA. And the legacy high-pressure sodium lights most of us grew up with had CCT ca. 2000K; there is no evidence for any benefit from using bluer lights, only negative impacts.

### **Social Justice**

The Roundhouse Lot is surrounded by low-income housing including at McDonald House at 49 South St. and the apartments at 34 South Street. For decades, renters in low-income housing in the U.S., including especially people of color, have suffered from policies of surveillance including excessive light at night that seriously impacts their quality of life and their health. This is well documented in a recent study, "Light pollution inequities in the continental United States: A distributive environmental justice analysis" (Nadybal et al 2020 -- more info at <https://www.darksky.org/black-history-month/>). The renovation of the Roundhouse Lot presents us with an opportunity to address this social justice problem locally by installing only the best lighting at only the minimum levels required, not repeating the mistake of overlighting with excessive blue light, glare and light trespass into the surrounding residences.



## **Flora and fauna**

The Roundhouse Lot is immediately adjacent to natural areas including the bed of the former Mill River, Veterans Field park, and the Manhan Rail Trail. Virtually all species of plants and animals are subject to negative effects from ALAN. Illumination levels as low as 0.01 fc – comparable to the light of the Full Moon – have measurable effects on a wide range of fauna including insects, birds, mammals, fish, and amphibians. Flowers and trees are negatively impacted as well: timing of blossom and leaf-out are directly affected by ambient light levels and color.

One reason Northampton City Lights has argued for the Pulaski Park lights to be replaced with much lower lumens, better shielding, warmer color, and timing controls: the city has worked with volunteers to plant a pollinator garden there. But pollinating insects are negatively affected by artificial light at night (ALAN), especially blue light, with up to 62% fewer visits to flowers at night, and significant reductions of visits even during the following day. Some species of insects are threatened with extinction due to ALAN. Now a similar pollinator garden is planned for the Roundhouse Lot -- so again, we'll be attracting insects by day, and killing them with artificial light at night.

## **Safety**

If the main justification for lighting the Roundhouse Lot is to provide safety against tripping over potholes or curbs or slipping on patches of ice at night, then the concern is best met with well-shielded lights that point down only, with zero glare. Glare only hinders visibility, it never helps it. Removing glare completely -- it's easy to do with the properly designed fixtures -- allows much lower levels of illumination to do the job of providing safety. There is no benefit from overlighting with bad lights, only cost.

If the concern is safety from criminals, then again, there is no benefit from overlighting: more light doesn't reduce crime. Hundreds of scientific studies over many decades underscore that point: there is no consensus among researchers of any link between lighting and crime. If more lighting reduced crime, then Las Vegas would be the safest city in the world. Criminals even benefit from light to see their targets. Thieves have stolen or tried to steal catalytic converters from numerous cars in Northampton in the last two years – and many of those cars were parked directly underneath streetlights. Strong glare, such as in the proposed lights, makes it harder, not easier, to see potential intruders. See summary and references here:

<https://www.darksky.org/light-pollution/lighting-crime-and-safety/>

Numerous US cities – e.g. Flagstaff and Tucson AZ – have found that reducing glare and overlighting not only saves money and energy and improves the view of the night sky, it comes at no cost to safety. Crime has not increased, and visibility is improved.

Safety and visibility come from well-designed lighting with appropriate brightness, color, and control for glare, not from more light. We disagree strongly with the premise that we need to

reach a “compromise” or “balance” between safety and protection of the night-time environment: both are served best with good lighting. The dichotomy is a false one.

### **Aesthetics, quality of life, and the starry sky**

We recognize that the Roundhouse Lot is in a downtown setting and we assume it will have light at night. But it should be good lighting -- mellow, beautiful, warm-color, zero-glare -- and should be only the minimal light needed for the job -- and that is much less than the lights proposed.

The Roundhouse itself is an important structure on a site rich with centuries of Northampton’s history (including, ironically, refining of natural gas for use in light fixtures many times less bright than the currently proposed LEDs). Just because the site has been paved over for parking doesn’t mean it should be over-illuminated with poorly designed lighting. On the contrary, the historical, architectural, and aesthetic value of the built environment surrounding the Roundhouse Lot should be enhanced by respectful and thoughtfully designed lighting – as is done in many of the great cities of the world.

Overhead, the star-studded sky is increasingly blotted out by light pollution, which is growing at 2% per year globally, double the rate of population growth. Satellite measurements show that on clear nights, downtown Northampton’s night sky is 6x brighter than a naturally dark sky (Fig. 6). (On cloudy nights, the sky can be more than 500x brighter than natural.) Only 20% of the roughly 5000 stars visible from a dark site are now visible from downtown, and the Milky Way is no longer visible.

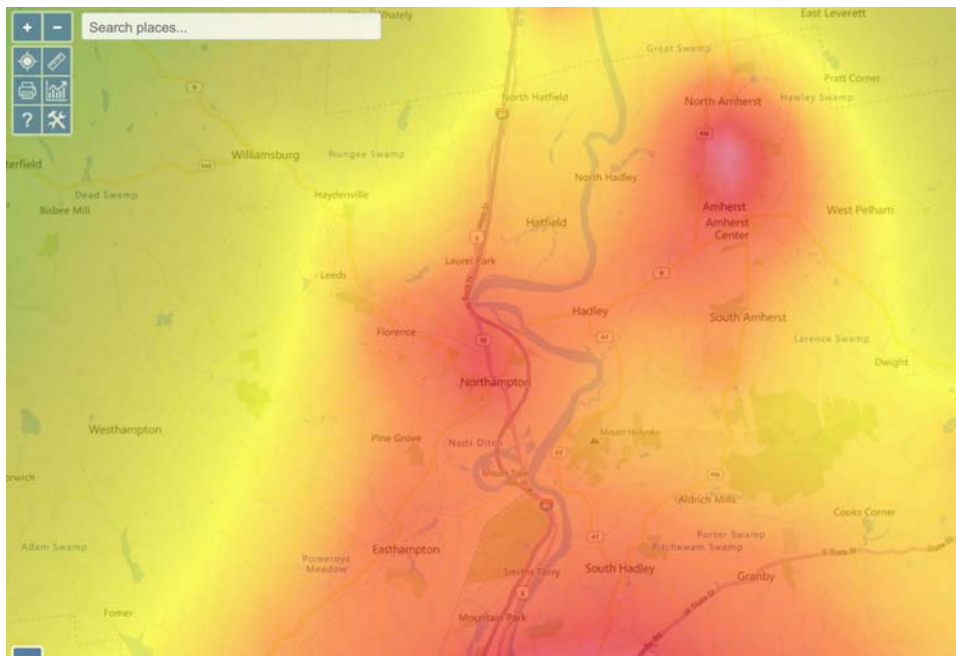


Figure 6: Light pollution map showing sky glow in the Northampton area. The night sky over downtown is 6x brighter than the naturally dark sky; the Milky Way and 80% of naturally visible stars are invisible. (Source: <https://www.lightpollutionmap.info/>)

The proposed fixtures have zero direct uplighting, but their high-blue content (3000K), their high intensity, and their poor shielding from glare mean that they would be a **significant new source of light pollution and sky glow**. Of the light that is directed where it should be directed – straight down – roughly 30% reflects off pavement into the sky, where it scatters off aerosol particles to create artificial sky glow. Worse, the light escaping sideways from the fixtures – also associated with glare and light trespass -- can potentially travel for even greater distance in the atmosphere, perhaps many miles, than direct uplighting, and is likely an even greater source of skyglow.

## VIII. Recommendations for improving the Roundhouse Lot lighting plan

The proposed lights are very far from the dark-sky-friendly, environment-friendly, safe and beautiful design that any site deserves. We can do much better.

We urge you to replace the excessively bright, high-glare, 3000K Lumec MetroScape with significantly less bright, warmer-color lights in well-shielded fixtures.

Two excellent examples can be found a few blocks away from the Roundhouse Lot:

- The inverted gooseneck-style lights at parking lots at Smith College (Sternberg, 2700K, some at 13W, about 1300 lumens) provide excellent visibility and safety in on a private residential campus for women where there is plenty of concern for safety (Figs. 7 and 8).
- The new amphitheater behind the newly renovated Neilson Library at Smith College includes post-top lights that provide beautiful, soft, mellow, inviting site lighting with warm color, zero glare, and much lower illumination levels than proposed in the Roundhouse Lot (Fig. 9).



*Figure 7: Gooseneck style lighting fixture in a Smith College parking lot. Glare, color, and brightness are all well controlled, enhancing visibility. (Sternberg, 13W, 2700K.) The lights proposed for the Roundhouse Lot would be 4-6x brighter, with significantly more glare.*



*Figure 8: Parking lot outside Ainsworth Gymnasium on the Smith College campus in Northampton. The fixtures have LED lights (2700K) that provide maximum illumination of 1.0 to 1.5 fc, with average values less than 0.5 fc. The proposed lights in the Roundhouse Lot would cause illumination levels more than 4x brighter with much worse glare.*



*Figure 9: Amphitheater, Nielson Library, Smith College. Post-top fixtures on terraced seats are fully shielded against glare, allowing low illumination levels less than 0.5 fc with excellent visibility and safety and warm, inviting ambiance. Note that the light fixtures themselves are practically invisible in this photo, a sign of successful lighting design; contrast that with the high-glare lights in Pulaski Park.*

Both the IES/IDA best-practice recommendations and the spirit and much of the letter of the Northampton lighting code are seriously violated with the proposed lighting. Light pollution is a serious problem that is growing worse every year. Now is the chance to help turn back that tide, not accelerate it.

Northampton City Lights looks forward to working with the city to redesign the Roundhouse Lot lighting with an eye toward protecting public health and safety, the environment, quality of life, and the view of the stars overhead.

Respectfully submitted,

Northampton City Lights Steering Committee