



# FAIRFAX COUNTY

## PROPOSED ZONING ORDINANCE AMENDMENT

### STAFF REPORT

# Outdoor Lighting Around Turner Farm Park Observatory

September 12, 2023

#### Hearing Dates

Planning Commission: October 18, 2023  
Board of Supervisors: November 21, 2023

#### Staff Contact

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Americans with Disabilities Act (ADA): Reasonable accommodation is available upon 48 hours advance notice. For additional information on ADA call 703-324-1334 or TTY 711 (Virginia Relay Center).



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**Background**

On February 11, 2020, as part of the adoption of a Zoning Ordinance amendment updating certain outdoor lighting provisions, the Board of Supervisors (Board) approved a follow-on motion directing staff to consider additional zoning regulations to protect dark skies around astronomical facilities. This motion was in response to comments received from the community and supported by the Planning Commission.

Turner Farm Park Observatory

The Board’s follow-on motion was based on Va. Code §15.2-920 which says:

“In addition to any other authority granted to localities by law, any locality may by ordinance regulate outdoor lighting within an area one-half mile around planetariums, astronomical observatories and meteorological laboratories. ...”

The only facility within the County that could be subject to such regulations is the Turner Farm Park Observatory (“Observatory”), located at the intersection of Georgetown Pike and Springvale Road within the Dranesville District. There is an additional observatory located at the Fairfax campus of George Mason University; however, the Zoning Ordinance does not apply on properties owned by the Commonwealth and used for the Commonwealth’s purposes.



*Figure 1 - Telescope at Turner Farm Park Observatory*

The Observatory consists of a roll-top observatory with multiple telescopes and a former National Defense Mapping Agency observation tower that will be converted to a remote access telescope observatory. The Observatory is part of a larger park complex that contains equestrian facilities, a playground, and a picnic area. The Observatory offers classes, summer camps, scout badges, and holds astronomy festivals. In addition to the for-fee activities, the Observatory is open for free to the public for viewing Friday nights, weather permitting. Volunteers from the Analemma

Society open the park for free viewing during astronomical events like eclipses and comets. The Observatory has served approximately 16,500 people in educational programs and viewing sessions since January of 2018. Currently, the Observatory is working toward becoming an

official Urban Night Sky Place from the International Dark Sky Association and hopes to become an education leader in dark sky preservation and value-centered lighting.

### Proposed Changes

Proposed text is provided below. [Section 5109](#) of the Zoning Ordinance contains standards for outdoor lighting that apply countywide and are intended to reduce the impacts of glare, light trespass, and light pollution; promote safety and security; and encourage energy conservation. These regulations support dark skies by requiring most lights to be dark sky compliant (full cut-off and mounted horizontal to the ground). In accordance with the Virginia Code, the proposed amendment would further limit outdoor lighting on properties located within one-half mile of the Observatory. These properties are zoned residential and developed with single-family detached dwellings or recreation facilities. The area includes 525 lots and is shown below:

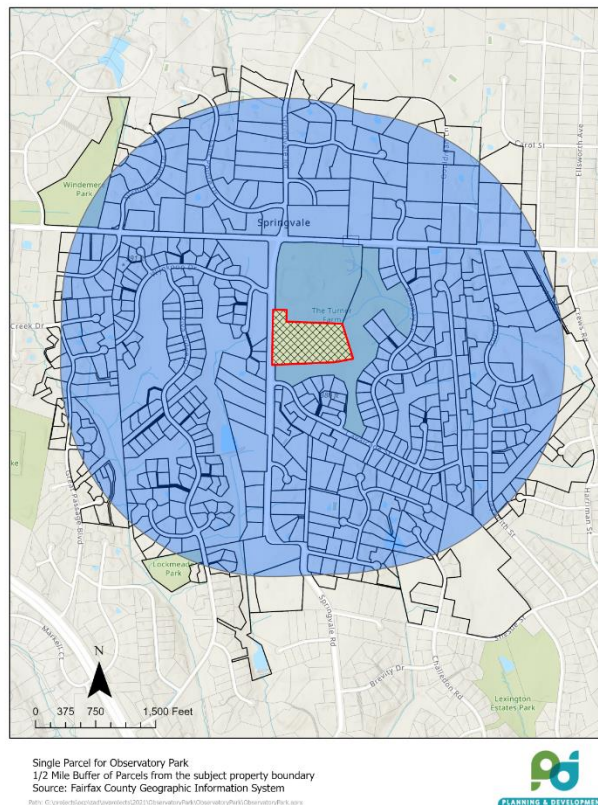


Figure 2 - One-Half Mile Area

Fairfax County is within an area of overall light pollution, but due to the scientific properties of light, lighting near the Observatory has a greater impact on the ability to engage in astronomical observation at the Observatory. For example, one light bulb located one-half mile from the Observatory would have approximately the same impact as four bulbs

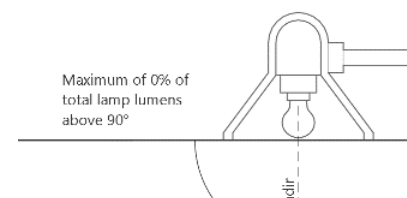


Figure 3 – Full cut-off fixture

located one mile away or almost 200 bulbs at Tysons, about seven miles away. However, to allow flexibility to install lighting for safety, security, and nighttime visibility, limits on (a) the number of lights per lot, and (b) the lumens for full cut-off lights, are not recommended. The Fairfax County Police Department has advised that proper lighting can be a deterrent for criminal activity, but overlighting is not needed to facilitate a safe environment.

In general, the proposed revisions allow for flexibility for outdoor lighting within one-half mile of the Observatory while preserving dark skies. The proposed regulations are summarized in the table below as compared to current countywide standards and are further discussed below.

<b>Current Zoning Ordinance standards (countywide)</b>	<b>Proposed amendment for Observatory area</b>
Previous amendments have allowed legally existing lights to remain until replaced.	Legally existing lights within one-half mile of the Observatory may remain until replaced.
<b>Motion-activated lights on single-family lots:</b> do not need to be full cut-off or meet the setback/shielding requirement (see footnote 2 below) if they are: (a) 4,000 lumens or less, (b) turn off within 5 minutes, and (c) are directed within the property.	No change to (b) or (c) but motion-activated lights must be 1,500 lumens or less (rather than 4,000 lumens). See below for more information about lumens.
<b>Other lights on single-family lots:</b> do not need to be full cut-off or meet the setback/shielding requirements if 1,500 lumens or less.	All lights need to be full cut-off and comply with the setback/shielding requirements, except for: <ul style="list-style-type: none"> <li>- any lights 20 lumens or less, and</li> <li>- any number of lights at a door or garage, up to 1,500 lumens/fixture.</li> </ul>
<b>Uplights or spotlights</b> (architectural features, flags, landscaping): any number allowed, but must be full cut-off or shielded to confine the light to the object.	Any number of fixtures allowed, with a maximum of 300 lumens/fixture.
<b>Color temperature:</b> Up to 3,000K.	Same.
<b>Light trespass:</b> No specific standard in the Zoning Ordinance, but there are standards for full cut-off fixtures and setback or shielding, and a prohibition on disability glare.	Same. The requirements above would reduce potential light trespass.



**What are lumens?** Lumens measure light output. This is different from watts, which measure electrical power consumption. Lumens can be converted from watts, but it depends on the efficiency of the bulb. The lumens are listed on light bulb packaging and sometimes on the bulb itself. Below are examples for comparing some typical light bulbs (based on <https://www.thecalculatorsite.com/energy/watts-lumens.php>):

<u>Incandescent Bulb Watts</u>	<u>Lumens</u>
250	3,000 – 4,500
100	1,200 – 1,800
60	720 – 1,080
25	300 – 450
1	12 – 18

- Previously existing lights:** As the outdoor lighting regulations have changed over time, lawfully existing lights in place prior to the effective date of the new regulations have been allowed to remain. Existing Applicability provisions are found in subsection 5109.1. Previous draft text for this amendment included two options for consideration – option 1 would have allowed lighting that was lawful when installed to remain until replaced, and option 2 would have required all lights to conform within five years. Based on community feedback, staff recommends allowing lawfully existing lights to remain until replaced (option 1 in the previous draft text). Therefore, the new regulations would apply only to new or replaced lighting fixtures. In accordance with subsection 5109.2.C, routine fixture maintenance, such as changing a light bulb or other components, does not constitute replacement if the changes do not result in a higher lumen output or a color temperature above 3,000K. Allowing existing light fixtures to remain indefinitely recognizes the financial investments of homeowners in lighting. New or replacement light fixtures that would comply with the proposed regulations are available at costs comparable to other light fixtures.
- Residential lighting:** Currently, lighting fixtures, such as porch lights, lamp posts, and landscape lighting, are not required to be full cut-off<sup>1</sup> or meet the setback/shielding requirement<sup>2</sup> if they are 1,500 lumens or less (about a 100-watt incandescent bulb). Over time, dark sky compliant lighting has become more available



<sup>1</sup> See subsection [5109.3.A\(1\)](#) which requires lights to be full cut-off and mounted horizontal to the ground.

<sup>2</sup> See subsection 5109.3.C(3) which requires lights abutting residentially zoned properties to be mounted at a height equal to or less than, Height = 3 + (Distance from lot line)/3) or have opaque shielding to reduce glare on

and can now be purchased in stores and online.<sup>3</sup> Within the one-half mile area around the Observatory, the proposed amendment would require all lights to be full cut-off and meet the setback/shielding requirement. This requirement would not apply to: (a) any number of lighting fixtures located at exterior doors or garages with a maximum of 1,500 lumens; (b) other lights, such as string or landscape lights, with up to 20 lumens; (c) motion-activated lights as discussed below; and (d) uplights or spotlights as discussed below.

- **Motion-activated:** Motion-activated lights are not currently required to be full cut-off or meet the setback/shielding requirement if they: (a) are 4,000 lumens or less, (b) turn off within five minutes of the motion ceasing, and (c) are aimed so that illumination is directed within the property. Within the one-half mile area around the Observatory, the proposed amendment would lower the current maximum of 4,000 lumens (approximately a 250-watt incandescent bulb) to 1,500 lumens, consistent with the current exemption for other types of residential lighting.
- **Uplighting and spotlighting:** Currently, uplights and spotlights are allowed for flags, landscaping, signs, statues, architectural, and other features if the light is aimed and shielded to be confined to the object. Given the potential impacts on dark skies, in addition to the requirement for aiming and shielding, the amendment proposes to establish a maximum of 300 lumens per fixture. This is intended to allow flexibility in lighting design while reducing impacts on the night sky.

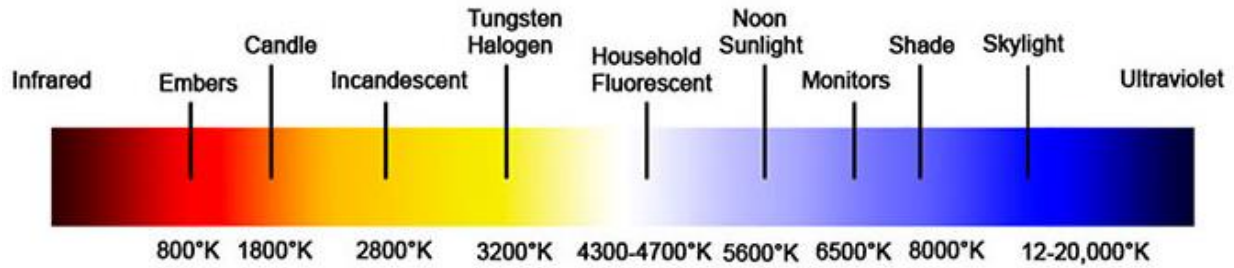
All other Zoning Ordinance outdoor lighting requirements would continue to apply, including maximum color temperature. Questions have been raised regarding whether the maximum allowed color temperature should be reduced within the one-half mile area. The countywide standard of 3,000K was adopted for streetlights in the Public Facilities Manual in 2019 and for private properties in the Zoning Ordinance in 2020. For reference, a typical incandescent bulb has a color temperature of approximately 2,600K to 3,000K. Color temperature impacts glare and bulbs with a lower color temperature, such as 2,700K, are now typically available. However, given the relatively recent adoption of the 3,000K standard and the limited difference between 2,700K and 3,000K, staff does not recommend revising the color temperature standard with this amendment.<sup>4</sup>

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the abutting property. For example, a light located 20 feet from the lot line could be mounted no higher than 9.67 feet, unless it had shielding.

<sup>3</sup> Images from homedepot.com

<sup>4</sup> Image from <https://www.ledwatcher.com/what-is-light-bulb-color-temperature-and-how-it-is-measured/>



## Community Outreach

Because the amendment would affect only the area surrounding the Turner Farm Park Observatory, outreach has been focused on and coordinated with the Great Falls community and the Dranesville district. The draft text was developed and revised based on feedback obtained at three town halls and through an online community survey. In general, feedback has been mixed, with some in favor of additional regulations, and some against. Information about the community outreach is available [online](#).

## Summary

Overall, the proposed amendment would support dark skies around the Observatory while allowing for flexibility in lighting design for individual properties. It is recommended that the amendment become effective at 12:01 a.m. on the day following adoption.

## Proposed Text

In the revisions shown below, text to be deleted is identified with ~~strike-through~~ and text to be added is underlined.

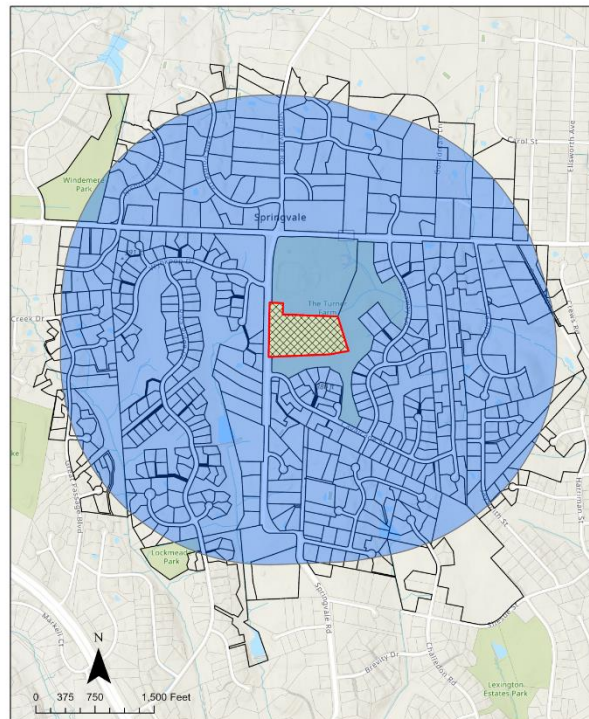
**#1 INSTRUCTION:** Add new subsection 5109.5, as shown below.

## 5. Lighting Standards Surrounding the Turner Farm Park Observatory

### A. Applicability

In addition to the other standards of this Section, properties located within one-half mile around the Turner Farm Park Observatory, as shown in Figure 5109.5 below, are subject to this subsection 5109.5. The one-half mile area is measured from the lot identified by Tax Map reference 12-1 ((1)) 24 as of (*insert effective date of this amendment*). If a lot is partially within the one-half mile area, these standards apply to the entire lot. The Applicability provisions in subsection 5109.1 also apply.

**Figure 5109.5: Turner Farm Park Observatory Half-Mile Area**





## **B. Lighting Fixtures and Mounting**

- (1) On lots developed with single-family dwellings, instead of the exemptions in subsections 5109.2.F and 5109.2.G, the following lighting fixtures do not need to be full cut-off and mounted horizontal to the ground as required by subsection 5109.3.A(1), or comply with the setback or shielding requirement in subsection 5109.3.C(3):
- (a) Motion activated lighting fixtures that:
    - 1. Emit initial lighting levels of 1,500 lumens or less;
    - 2. Are extinguished within five minutes upon cessation of motion; and
    - 3. Are aimed to direct the illumination within the property boundary.
  - (b) Lighting fixtures located at an exterior door or garage with initial lighting levels of 1,500 lumens or less per fixture. These fixtures must be located within three feet of and intended to illuminate the immediate area of the door or garage.
  - (c) Lighting fixtures of 20 lumens or less.
- (2) Uplights or spotlights in accordance with subsection 5109.3.A(4) are allowed with initial lighting levels of 300 lumens. The lights must be full cut-off and mounted horizontal to the ground or directionally shielded, aimed, and controlled to confine the light to the object intended to be illuminated. The setback or shielding requirement of subsection 5109.3.C(3) applies to these lights.

**#2 INSTRUCTION: Revise the Applicability provisions of subsection 5109.1.B, as shown below.**

### **1. Applicability**

- A.** These outdoor lighting standards apply to the installation of new outdoor lighting fixtures or the replacement of existing outdoor fixtures, except as provided in subsection 2 below.
- B.** Previously existing lighting fixtures:
- (1) Outdoor lighting fixtures lawfully existing before June 17, 2003, that do not conform to the provisions of this section ~~are deemed to be a lawful nonconforming use and~~ may remain.
  - (2) For the purpose of the provisions in subsections ~~3.A(2) (correlated color temperature), 5109.2.F (exemptions for motion activated light fixtures), and 5109.2.G (exemptions for lots developed with single-family dwellings), and 5109.3.A(2) (correlated color temperature),~~ outdoor lighting fixtures lawfully existing before February 12, 2020, ~~are deemed to be a lawful nonconforming use and~~ may remain. ~~A nonconforming lighting fixture that is changed to or replaced by a conforming lighting fixture is no longer deemed nonconforming and must be in accordance with the provisions of this section.~~
  - (3) For properties subject to subsection 5109.5, outdoor lighting fixtures lawfully existing before *(insert effective date of this amendment)*, that do not conform to the provisions of subsection 5109.5 may remain.