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Comment
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***1077 ARIZONA'S NIGHT LIGHTING REGULATIONS FACILITATING ASTRONOMICAL OBSERVATION**

INTRODUCTION

Given the many world-class telescopes in Arizona, there are plenty of opportunities for astronomy experiments in the state.¹ Because astronomical activities have a huge economic value, it is important that Arizona's ordinances support the sky clarity necessary for astronomical observation.² Human industrialization and other cultural developments have brightened the night sky--hindering astronomical observation activities.³ During the last century, cities and counties in Arizona began to enact lighting ordinances to maintain the night air conditions that are necessary to accommodate astronomical labs.⁴ Though they all have the same goal of maintaining a sufficiently dark sky for observatory telescopes, these ordinances take different approaches.⁵ This comment briefly introduces and compares the relevant ordinances of Pima County (Tucson), Maricopa County (Phoenix), and Coconino County (Flagstaff) and gives suggestions to enhance the efforts to promote night sky clarity.

I. PIMA COUNTY'S "OUTDOOR LIGHTING CODE"

The University of Arizona in Tucson was ranked the second best astronomy school in a ranking among over five hundred public and private universities nationwide for research expenditures in 2012.⁶ Such a unique achievement by Tucson's major university inspired the *1078 city to promulgate the city/county "Outdoor Lighting Code" in 2012.⁷ Among other things, Pima County's code aims to facilitate astronomical activities within the area.⁸ The code tries to accomplish this goal with expansive and detailed coverage of outdoor lighting regulations.⁹ This includes definitions of specific rules, prohibitions, and standards.¹⁰ Procedural issues are addressed in detail and enforcement issues are also included, as one will find in the provisions of permit applications, inspections, violations and appeals.¹¹ Additionally, the code adopts a restrictive approach and allows exemption applications.¹²

The 2012 Tucson/Pima County Outdoor Lighting Code divides the city into six "lighting areas" and sets different illumination levels and shielding requirements for each area.¹³ In the said code, "lumen" was defined as a "unit of luminous flux," and "used to measure the amount of light emitted by lamps."¹⁴ Each area has a specified lumen cap, which is a maximum lumen limit.¹⁵ Separate requirements for the illumination of outdoor signs, recreational facilities, and major roadways are also provided in the code.¹⁶ Furthermore, the code also regulates the color temperature (gradient of light) and curfew hours, which can be as early as 9:00 pm, for lighting.¹⁷ Both are based on the different lighting levels and areas.¹⁸

Tucson has tried to tackle the light pollution problem for many years and has made impressive progress. For example, Kitt Peak National Observatory in Tucson has maintained the same level of night darkness over the past decade despite Tucson's population growth during that time period.¹⁹ Since Tucson has around one million residents, reducing light pollution is a

challenge, even with “one of the world’s most progressive light-reduction city ordinances.”²⁰

***1079 II. MARICOPA COUNTY’S “OUTDOOR LIGHT CONTROL PROVISIONS”**

In Maricopa County, the “Outdoor Light Control Provisions” appear under the zoning ordinance.²¹ There are no lighting area distinctions inside the county, hence the rules tend to be more general when compared to those in Tucson.²² Maricopa County’s provisions contain shielding and filtering requirements for outdoor lighting fixtures, but no specific enforcement procedures for the regulations.²³ These provisions have relatively lenient language for outdoor lighting.²⁴

Maricopa County’s prior version was criticized for overly simple guidelines, because it posed risks to nearby areas including Tucson which has better night darkness preservation.²⁵ The current version still has a long way to go before it can formulate a sufficiently detailed regulation on the point, as it does not introduce many substantial changes.²⁶

III. COCONINO COUNTY’S LIGHTING SECTION IN THE ORDINANCE

Similar to Tucson, Flagstaff has the world-class Lowell Observatory. The presence of the observatory has encouraged Flagstaff to adopt ordinances similar to those in Tucson.²⁷ Section twenty seven of Coconino County Zoning Ordinance 2013 provides a comprehensive regulation on outdoor lighting within the area.²⁸ Section twenty seven has classified the outdoor lighting into three different classes based on its function, coupled with three lighting zones based on their relationship with the Hall telescope at Lowell Observatory on Anderson Mesa, the Kaj Strand telescope at the U.S. Naval Observatory, Roden Crater and the Discovery Channel Telescope.²⁹ The ordinance also has clearer examples of shielding types than Tucson or Phoenix.³⁰ It uses tables to illustrate requirements for lamp types and shields in the three lighting zones and classes, as well as “Maximum Total Outdoor Light Output Standards” for different zones and different land use.³¹ Different curfew times also apply to different lighting zones, the earliest of which is at 9:00 pm for the area around the astronomical facilities.³² It also has provisions for specific use facilities like advertising signs and recreational facilities.³³ The procedures for compliance are also enumerated in detail with clear guidance on practice.³⁴

***1080** Flagstaff was designated the world’s first “International Dark Sky City” by the International Dark Sky Association.³⁵ Inspired by such a great achievement in protecting the night sky and the Lowell Observatory, the city of Flagstaff proclaimed 2014 as its “Year of the Night Sky.”³⁶ From the city’s act of setting up a “Year of the Night Sky”, Flagstaff shows that it is willing to put more effort in preserving the night skies for astronomical observation.

IV. CONCLUSIONS

Maricopa County and Phoenix have less incentive to preserve dark sky because they do not have an observatory in the area. Amateur astronomical observers are at the mercy of the local city developers.³⁷ Expansion of the city might make “Outdoor Light Control Provisions” inadequate to effectively regulate the night lighting, thereby hindering the astronomical labs.³⁸ Its loose regulations might also harm the night observatory environment for the top observatories within Arizona, considering the close distance. It is necessary that the state regulate lighting fixtures with a more specific and detailed approach under Chapter seven Title forty-nine of Arizona Revised Statutes, which regulates light pollution. Even though the locality in each area requires specific rules in different regions, it is still possible for the state government to require city governments to set limit standards according to the respective conditions and provide adequate enforcing measures of the regulations. The state can set the lowest standard to guarantee that the autonomy of each county does not negatively impact the surrounding observatory conditions.

Footnotes

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¹ *How To: Get Down With What’s Up in the Air in Arizona*, VISIT ARIZONA (Mar. 28, 2012), <http://www.visitarizona.com/press-room/press-releases/how-to-get-down-with-what-s-up-in-the-air-in-arizona>.

- ² *A&D SECTORS: SPACE AND ASTRONOMY*, ARIZONA COMMERCE AUTHORITY (last visited Oct. 27, 2015), <http://www.azcommerce.com/industries/aerospace-defense/ad-sectors/spaceastronomy>.
- ³ David Owen, *The Dark Side: Making War on Light Pollution*, THE NEW YORKER (Aug. 20, 2007) available at <http://www.newyorker.com/magazine/2007/08/20/the-dark-side-2>.
- ⁴ *Astronomers Are Complaining: The Stars Are In The Heavens But All's Not Right With The World*, Herald-Journal, Jun. 17, 1982, at B8, available at <https://news.google.com/newspapers?nid=1876&dat=19820617&id=EoosAAAIBAJ&sjid=5M4EAAAIBAJ&pg=6853,3572590&hl=en>.
- ⁵ Alla Goldman, *Light Pollution in Central and Southern Arizona: A Runaway Problem with an Achievable Solution*, 3 ARIZ. J. ENVTL. L. & POL'Y, 1029 (2012), available at <http://www.ajelp.com/comments/light-pollution-in-central-and-southern-arizona-a-run-awayproblem-with-an-achievable-solution/> (last visited Oct. 25, 2015).
- ⁶ Daniel Stolte, *UA Ranked Second in the Nation for Physical Sciences Research Funding*, UNIVERSITY COMMUNICATIONS (March 19, 2014), <http://uanews.org/story/ua-ranked-second-in-the-nation-for-physical-sciences-research-funding>.
- ⁷ Tucson, Ariz., Ordinance 10,963 (Feb. 7, 2012) (adopting 2012 City of Tucson/Pima County Outdoor Lighting Code), available at https://www.tucsonaz.gov/files/pdsd/codes-ordinances/2012_outdoor_lighting_code_.pdf.
- ⁸ *Id.* §101.3.
- ⁹ *Supra* note 7.
- ¹⁰ *Id.*
- ¹¹ *Id.*
- ¹² *Id.* §§102-103.
- ¹³ *Id.* Ch. 3-4.
- ¹⁴ *Id.* §202.
- ¹⁵ *Id.* Ch. 4.
- ¹⁶ *Id.*
- ¹⁷ *Supra* note 7.
- ¹⁸ *Id.*

19 Tom Beal, *Kitt Peak Remains in Dark, Shows Effectiveness of Local Lighting Laws*, ARIZ. DAILY STAR (Sept. 16, 2010, 12:00 AM), http://azstarnet.com/news/local/kitt-peak-remains-in-dark-show-seffectiveness-of-local-lighting/article_b1fb01f4-c064-5247-a9e9-48abdef02b75.html; Press Release, *Kitt Peak Night Sky is Still Dark*, NAT'L OPTICAL ASTRONOMY OBSERVATORY (Sept. 21, 2010), available at <http://www.noao.edu/news/2010/pr1003.php>.

20 *Light Pollution*, NAT'L OPTICAL ASTRONOMY OBSERVATORY, <http://www.noao.edu/education/gsmst/lp> (last visited Oct. 25, 2015).

21 Maricopa Cty, Ariz., Zoning Ordinance § 1112 (2015).

22 *Id.*

23 *Id.*

24 *Id.*

25 *Supra* note 5.

26 *Id.*

27 COCONINO CTY, ARIZ., ZONING ORDINANCE § 27 (2013).

28 *Id.*

29 *Id.*

30 *Id.*

31 *Id.*

32 *Id.*

33 *Id.*

34 *Id.*

35 *International Dark Sky City*, FLAGSTAFF DARK SKIES COALITION, <http://www.flagstaffdarkskies.org/international-dark-sky-city/> (last visited Oct. 26, 2015).

36 *Flagstaff Celebrates it's Star-Filled Night Skies*, FLAGSTAFF DARK SKIES COALITION, <http://www.flagstaffdarkskies.org/2014-year-night-sky/> (last visited Oct. 26, 2015).

37 J. Scott Feierabend, *Phoenix's New Lights Don't Lead To A Brighter Future*, AZCENTRAL (Jun. 12, 2015, 8:02 PM),

<http://www.azcentral.com/story/opinion/op-ed/2015/06/12/phoenixs-new-lights-lead-brighter-future/71139248/>.

38

Id.