



CITY OF FLAGSTAFF

International Dark Sky Association 2019 Annual Report



The winter sky from Lake Mary, near Lowell's dark-sky site at Anderson Mesa.

Visible on the horizon is the sky glow from Flagstaff (right, 8 miles away) and Phoenix (left, 110 miles away). (Photo by Jared Stern.)

INTRODUCTION

The City of Flagstaff and the northern Arizona region have achieved worldwide recognition for innovative leadership in the protection of dark skies. Beginning with Ordinance 400 in 1958 that addressed searchlights, over a half-century of policy decisions and implementations have fostered an astronomy industry that now includes Lowell Observatory, the U.S. Naval Observatory, the Navy Prototype Optical Interferometer, the National Undergraduate Research Observatory, the U.S. Geological Survey Astrogeology Center, and the new Discovery Channel Telescope. Public support for protection of the night sky for both general enjoyment and professional deep space research has become an established element of community and regional identity.

Zoning Codes that restricted the amount of light per acre in outdoor lighting installations were approved by both the City and the County in 1989, and since then the codes have been periodically updated and strengthened. On October 24, 2001, Flagstaff was recognized as the world's First International Dark Sky City for its pioneering work balancing preservation of our night sky natural resource with concerns about public safety and economic security. Rather than allow this significant economic and cultural inheritance to be degraded, the region's hard-won reputation and accomplishments are acknowledged as vital assets that must continue to be enhanced.

The region must implement evolving standards that proactively address problems associated with increased artificial light, air pollution, illuminated signage, and development - both adjacent to major scientific instruments and within the region. These standards are necessary for the region to remain one of the premiere astronomic sites in the world, to properly recognize preservation of naturally dark night skies as a persistent expression of community values, and to better-utilize a critical economic and tourism attractant.

CITY OF FLAGSTAFF DARK SKY COMMITTEE

In order to prepare for this year's annual report a committee was formed consisting of Planning, Code Compliance and Traffic Engineering staff. This committee is quickly evolving into an expert group on all things related to outdoor lighting. Other divisions within the City are reaching out to these individuals to utilize the expertise they bring to outdoor lighting compliance. The team went so far as to develop objectives for next year to protect dark skies. In the coming year the team intends to refine the compliance process, increase outreach and education activities, coordinate with surrounding jurisdictions (especially Coconino County), improve data collection, inventory legal non-conforming properties, and identify opportunities to bring them into compliance.

FLAGSTAFF REGIONAL PLAN 2030 GOALS AND POLICIES (No Updates in 2019)

Goal E&C.5. Preserve dark skies as an unspoiled natural resource, basis for an important economic sector, and core element of community character.

Policy E&C.5.1. Evaluate the impacts of the retention of dark skies regarding lighting infrastructure and regulatory changes, land use decisions or changes, and proposed transportation developments within the region.

Policy E&C.5.2. Encourage and incentivize voluntary reduction of "exempt" lighting that degrades night sky visibility, and work to prevent light trespass whenever possible in both public and private areas.

Policy E&C.5.3. Continue to enforce dark sky ordinances.

Policy E&C.5.4. Encourage uses within Lighting Zone 1 of the lighting codes of the City and County that do not require outdoor lighting and discourage those which require all-night lighting.

ZONING REGULATION OVERVIEW (No updates in 2019)

The City was recognized as the world's first International Dark Sky City on October 24, 2001 for its pioneering work in the development and implementation of lighting codes that balance the need to preserve Flagstaff's dark sky resource with the need for safe lighting practices. The purpose of the zoning regulations is to help assure that dark skies remain a resource to be enjoyed by the Flagstaff community and its visitors, and to provide safe and efficient outdoor lighting regulations that protect Flagstaff's dark skies from careless and wasteful lighting practices. Dark starry nights, like natural landscapes, forests, clean water, wildlife, and clear unpolluted air, are valued in many ways by the residents of this community, and they provide the natural resource upon which our world-renowned astronomical industry depends.

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 concerns include:

- The degradation of the nighttime visual environment by the production of unsightly and hazardous glare;
- Lighting practices that produce excessive glare and brightness that interfere with the health, safety and welfare of Flagstaff's citizens and visitors;
- Unnecessary waste of energy and resources in the production of too much or wasted light;
- Interference in the use of property for the education, enjoyment, research, and safety which is impacted by night light trespass, and the loss of the night sky due to increased urban sky glow; and
- The impact of inappropriately designed outdoor lighting that disrupts nocturnal animal behavior, particularly migrating birds and other species.

In addition, the City and surrounding areas are uniquely suited for astronomical observation due to their topographic and atmospheric conditions. To assist in maintaining these conditions, the City promotes the reduction of light pollution so that the observatories within and adjacent to the City can maintain and carry out successful missions and operation.

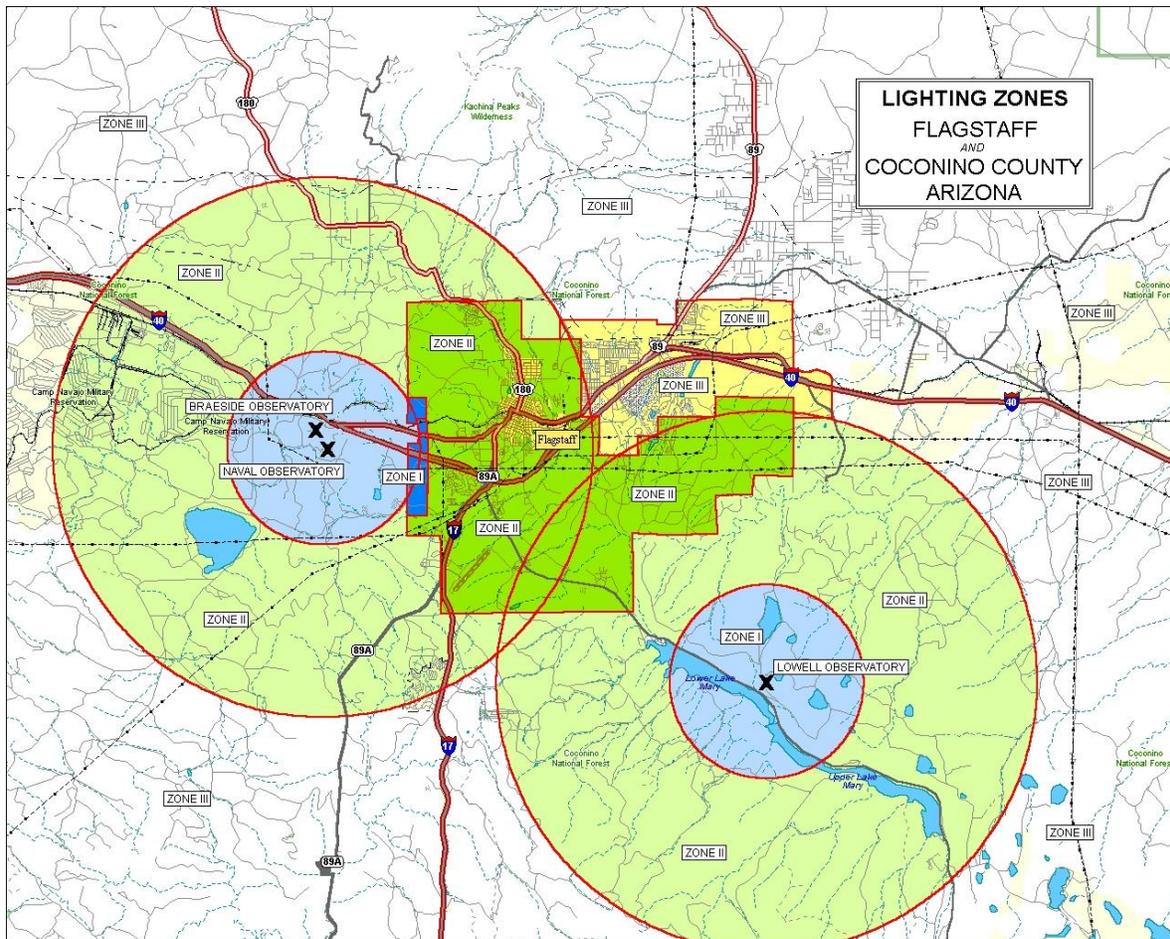
The concerns of aesthetic appearance, dark sky protection, operation objectives, and utility does need not compete. Good, modern lighting practices provide adequate light for safety and utility without excessive glare or light pollution. Also, attention to when, where, type, and how much night-time lighting results in better lighting practices, darker skies and reduced energy use and costs.

Therefore, it is the intent of the Zoning Code to encourage lighting practices and systems which will:

- Minimize light pollution, glare, and light trespass;
- Conserve energy and resources while maintaining night time safety, utility, security, and productivity; and
- Curtail the degradation of the night time visual environment.

The sensitivity of different areas to the obtrusive impacts of outdoor lighting use depends on many factors, including the dominant use of the area (e.g. residential, industrial or commercial). Further, the

effect of outdoor lighting on light pollution to the observatories is strongly dependent on the distance of those lights from the observatories. Therefore, three lighting Zones are established, with varying standards designed to address the principal issues associated with each area.



ZONING CODE UPDATES (2019-2020)

The City of Flagstaff is in the process of evaluating and updating the outdoor lighting requirements of the Zoning Code. The current requirements have been reviewed by a local lighting expert who has helped draft all off the lighting codes in Flagstaff and Coconino County since their inception. Earlier this year, this individual made a series of recommended modifications to the Zoning Code in response to the Naval Observatory Flagstaff Station Mission Compatibility Light Pollution Study discussed later in this report.

Members of the Dark Sky Committee have also drawn upon their combined outdoor lighting expertise to identify additional Zoning Code modifications that are necessary to achieve the City's dark sky objectives. Staff has identified these potential changes by drawing on previous outdoor lighting, training, and increased attention to lighting plan requirements, compliance, and enforcement over the past year. Staff has begun a more through and comprehensive evaluation to update the City's lighting Zoning Code provisions, given the large number of Zoning Code changes that Staff deems necessary to protect Flagstaff's dark skies. In addition, Staff will evaluate methods to incorporate the findings and considerations pertaining to night sky glow and outdoor lighting identified in the 2018 Naval

Observatory Mission report. It is anticipated that the Zoning Code will be updated through a public hearing process during the next reporting year.

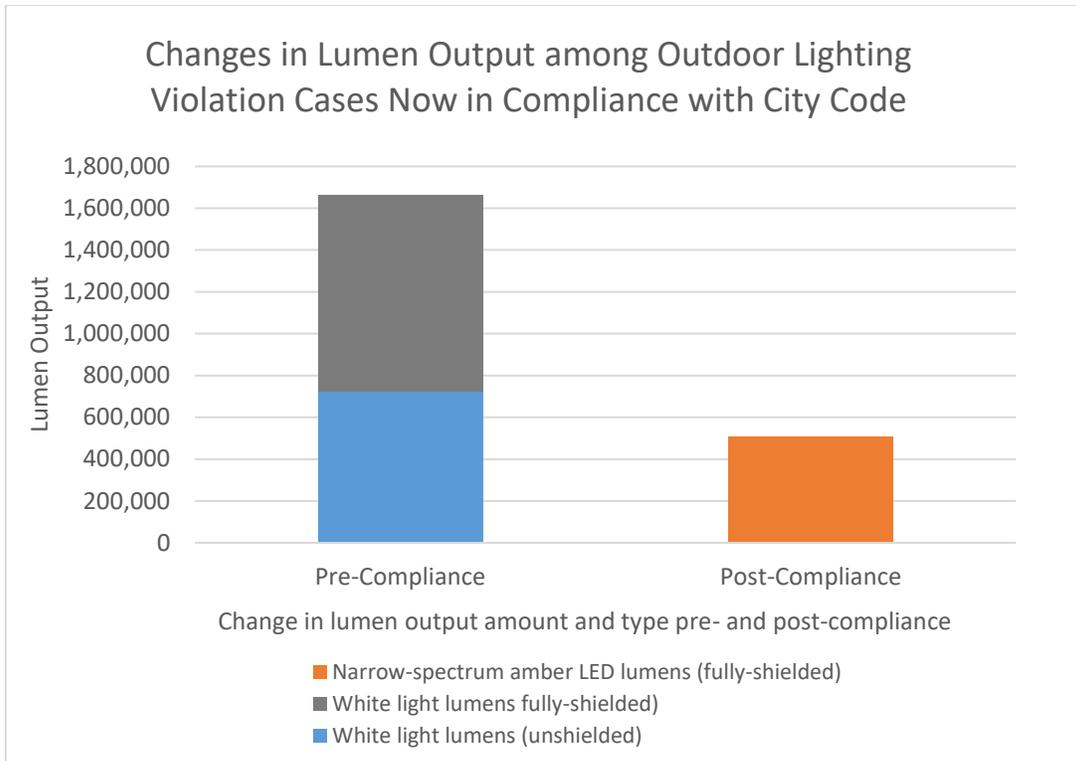
UPDATE OF THE OUTDOOR LIGHTING PERMIT AND ASSOCIATED PROCESSES/PROCEDURES (2019)

City Staff updated the Outdoor Lighting Permit application (attached as exhibit) in August 2019 with the goal to help business owners, electrical contractors, and the public better understand permit requirements and the Outdoor Lighting Code (section 10-50.70 of the City of Flagstaff Zoning Code). The application now provides a step-by-step process to determine the maximum lumens allowed for site, which is divided into several categories: total lumens, non-LPS (Low-Pressure Sodium)/non-NSALED (Narrow-Spectrum Amber LED) lumens, and partially-shielded lumens (no unshielded lumens are allowed). It also includes detailed instructions to calculate the lumen output of proposed light fixtures, and to compare these calculations to allowed lumens. It requires applicants who propose to update lighting on an existing development to inventory outdoor lighting already present on the site so that the City can track lumens prior to and after lighting modifications. Finally, it includes detailed information on key components of the Outdoor Lighting Code, including the definition of a NSALED lamp, examples of fully- and partially-shielded fixtures, and recessed fixtures eligible for a reduction in lumen output calculations.

Staff also created several companion documents (attached as exhibit) for Planning and Code Compliance Staff to use throughout the Outdoor Lighting Permit review, approval, inspection, and close out process. The purpose of these documents is to encourage consistent and thorough review of all Outdoor Lighting Permits across staff members, facilitate effective record-keeping, and ensure that all Outdoor Lighting Permits are not closed until they pass inspection. The *Outdoor Lighting Permit Review Checklist* guides Staff through a detailed review of the Outdoor Lighting Permit to ensure that the application is complete and accurate, and that all lighting proposed in the application meets City Code. The *Permit Review, Archival, and Inspection Checklist* guides Staff through the permit review, approval, archival, and final inspection/close out process. The *Standard Approval Comments* document gives Staff consistent conditions to attach to each approved Outdoor Lighting Permit, with additional comments for permits associated with a Building Permit, Concept/Site Plan Review, or a lighting violation. Staff is also in the process of developing a checklist for reviewing outdoor lighting violation cases (and associated Outdoor Lighting Permit applications) that contain legal nonconforming lighting (lighting that was legal when it was approved but that does not meet the current code).

OUTDOOR LIGHTING COMPLIANCE EFFORTS (Updated 2019)

The City of Flagstaff Code Compliance program investigates potential lighting violations on a proactive basis and in response to complaints. As part of these investigations Staff also identifies properties with legal non-conforming outdoor lighting in the hope that education and assistance may bring these properties into compliance with the current outdoor lighting code. Staff continues to conduct annual audits to identify non-compliant properties and track progress in correcting issues. In 2019, Code Compliance responded to 38 violations, most of which were on commercial properties involving the replacement of LPS fixtures with white LED fixtures. Approximately half of these violations are now in compliance with the current code. Staff estimates that the properties that have been brought into compliance are now emitting about 1.6 million fewer lumens of white light than they did when the violation was first identified. These lumens have been replaced with approximately 500,000 lumens of fully-shielded NSALED light.



In 2018 Staff was allocated budget to purchase a light spectrometer to assist with outdoor lighting compliance cases. Staff has since purchased the spectrometer and has been trained on its use. This new tool allows Staff to provide definitive information on existing lighting sources and assists with identifying light sources that are currently out of compliance with City of Flagstaff regulations. Code Compliance Staff has become so proficient with this tool that they are now completing inspections on all Outdoor Lighting Permit applications and certificates of occupancy for new and remodeled commercial and multi-family buildings. These inspections are helping to ensure that the fixtures proposed in the application are installed as approved. Staff has identified several instances of NSALED being replaced with other unapproved amber LEDs and has worked with the permit applicants and property owners to correct this.

As part of the 2019 budget process a new position was approved for the City of Flagstaff with contributions from Coconino County and Lowell Observatory. This new position is for a Dark Sky Code Compliance Specialist shared between the City of Flagstaff and Coconino County. The City of Flagstaff has approved this position as an on-going position with two years of funding from Coconino County. Staff will likely need to make future budget requests in order to extend this position permanently. This position will include the following duties:

- Proactively identifies Outdoor Lighting Standards violations during routine evening patrol.
- Utilizes optical spectrometer, correlated software and tools while investigating Outdoor Lighting Standards violations.
- Compiles data specific to Outdoor Lighting Standards violations, and routinely reports data to the Code Compliance Manager.
- Works with Building Safety and Planning and Development to provide inspection services for Outdoor Lighting Permit applications.

- Provides and participates in education outreach for outdoor lighting and the protection of dark skies.
- Assists with the identification of acceptable lighting sources.
- Reviews and approves outdoor lighting permit applications.

This sticker was created by Code Compliance Staff for locations that have verified compliant outdoor lighting.



STREET LIGHTING TO ENHANCE DARK SKIES OVERVIEW (Updated 2019)

The Street Lighting for Enhancing Dark Skies (SLEDS) Project’s primary objective is to find a solution to Flagstaff’s current street lighting challenges (loss of low-pressure sodium) while balancing dark skies, safety and maintenance/cost effectiveness objectives.

The SLEDS Project is the result of several years of discussions between the City and the local observatories (United States Naval Observatory – Flagstaff Station and Lowell Observatory) that started in May 2012. At that time, the City found itself in a lighting predicament as Low Pressure Sodium (LPS), the preferred lighting source since 1989, was becoming increasingly more expensive to purchase, quality replacement parts were becoming more difficult to acquire, and the City was experiencing structural failures of the pole/mast arm connection due to the size and weight of the LPS fixture, especially in wind prone areas.

In June 2015, the Flagstaff City Council approved an Inter-Governmental Agreement (IGA) with the Arizona Department of Transportation (ADOT) to secure funding for the SLEDS Project. This was in the form of \$100K (FY16) to hire a Consultant Team (ultimately Monrad Engineering), \$200K (FY16) for test fixtures to support the Consultant Team’s work, and \$370K (FY18) for the first phase of lighting replacements. With all of the funding anticipated from the Flagstaff Metropolitan Planning Organization’s (FMPO) Surface Transportation Program (STP) allocations. The SLEDS Project is an opportunity for Flagstaff to demonstrate to other municipalities an innovative lighting solution for

dark sky preservation with Light Emitting Diode (LED) technology that achieves municipal objectives for safety and cost effectiveness, and astronomical objectives for maintaining dark skies and innovation that advances the industry or best practices for technology transfer to preserve dark skies.

The Request for Proposals (RFP) for SLEDS defined the project's measures of effectiveness:

"The City seeks cost effective replacement technologies that (1) maintain or approximate current lighting levels and (2) do not adversely impact the City's dark sky natural resource or the missions of the Lowell Observatory and the U.S. Naval Observatory. In consideration of cost effectiveness, the City seeks to utilize existing light pole infrastructure.

Measures of Effectiveness may include:

- Light uniformity
- (1) Brightness and (2) spectrum analysis from several perspectives including:
 - On the street
 - At the observatories
 - General sky brightness
 - Identification of ambient light levels (i.e. absence of streetlights)
- Color rendition
- Wind loading (Effective Projected Area)
- Public commentary on lighting levels and color rendition
- Life cycle costs including, but not limited to, initial capital expense, energy use, and maintenance"

In September 2015, the Consultant Team, led by Monrad Engineering, was awarded a \$100K contract to conduct applied research in order to develop a replacement strategy for the City's increasingly obsolete LPS street lights with newer technology (LED).

The SLEDS Team has worked through several tasks to date:

- An assessment of the viability of continuing to use LPS
- A structural analysis of existing light pole/mast arm assembly and retrofit recommendation for existing poles/masts
- Pre-installation observations and measurements of "sky glow" of the Cheshire and arterial test areas have been completed through ground, aerial and satellite measuring techniques
- Test fixture recommendations have been divided into two categories:
 - Arterials and selected Major Collectors
 - Selected Major Collectors, Minor Collectors and Local Roads
- Developed specifications for the Minor Collector / Residential Narrow Spectrum Amber Light Emitting Diode (NSALED) test fixtures and Arterial Hybrid Light Emitting Diode (HLED) 80% NSALED/20% 2700K LED test fixtures and Arterial 12,000 lumen NBALED test fixtures
- Solicited public feedback on the test installations through an on-line survey
- Completed procurement of almost 200 test fixtures
- SLEDS Team identified test locations for the Arterial, Collector and Local roadway test strips
- Installation of test fixtures on various Arterial, Collector and Residential locations

- A bus tour was held with several residents and City Council members
- A second evening tour of test strips was coordinated with the local members of the Flagstaff Dark Skies Coalition

2019 highlights and accomplishment for the SLEDS Project include the following items:

- Flagstaff voters approved a renewal of the local transportation tax, Proposition 419. The tax includes \$8,000,000 for roadway lighting upgrades identified in the SLEDS report.
- The City is coordinating the SLEDS project with the Arizona Department of Transportation as ADOT is moving towards LED lighting replacements of legacy High Pressure Sodium installations in Flagstaff
- SLEDS consultant team draft Final Report
- SLEDS Team meetings to discuss results of the test areas and review of the draft Final Report
- City Council presentation regarding project updates
- Continued NSALED fixture testing through small area test sites

SLEDS next steps:

- Develop new City Engineering Standards for Street Lighting
- Develop City Wide replacement scenarios
- Finalize SLEDS Project Report and present to Public and City Council

NAVAL OBSERVATORY FLAGSTAFF STATION MISSION COMPATIBILITY LIGHT POLLUTION STUDY

In response to various development proposals over the past several years, the Naval Observatory Flagstaff Station (NOFS) completed a Mission Compatibility study to evaluate mission impact from light pollution, present findings, and outline recommendations for consideration by the City of Flagstaff and Coconino County to minimize the impact to the Dark Sky and the NOFS military mission.

The study sought answers to two questions:

1. What is the expected impact of development in the region on the Naval Observatory Flagstaff Station's (NOFS) observing conditions?
2. Are the current lighting standards and patterns of expected development compatible with the long-term ability of the NOFS to fulfill Department of Defense mission requirements?

The study was completed in three phases. Phase one quantified the current sky brightness at the NOFS. An inventory and analysis were completed of the existing and potential land uses in the region and finally a quantitative prediction of sky brightness resulting from new development. The second phase defined the maximum sky brightness that will be compatible with NOFS mission. Phase three developed six mitigation strategies to preserve the NOFS mission and operational capabilities.

On July 26, 2017 a meeting was held at Lowell Observatory to discuss the Mission Compatibility Study. Attendees included the United States Navy and Naval Observatory staff, Lowell Observatory, members of the Flagstaff Dark Sky Coalition, Coconino County and City of Flagstaff staff. An Executive Summary of the study was provided and is attached to this report. Attendees discussed the findings and recommendations. Some of the recommendations will require amendments to the current lighting standards. The City and County agreed that aligning our standards should be a priority as well as

presenting the recommendations to the community and drafting the required amendments. The Executive Summary was presented at a Joint City Council/Board of Supervisors meeting on June 4, 2018 and Council has given us a “Go” to proceed.

JOINT LAND USE STUDY OVERVIEW

The goal of the Joint Land Use Study (JLUS) is for local governments, stakeholders, and military installations to study, make recommendations, and provide a report that contains an implementation plan for compatible land use between the United States Naval Observatory Flagstaff Station, the Arizona Army National Guard Camp Navajo while also supporting diverse community values. Additionally, the purpose of the JLUS is to prevent incompatible uses surrounding military installations that may interfere with the ability to complete the mission of the facility and to limit impacts of the installations on surrounding property owners. Coconino County is the local sponsor for the proposed \$479,430 grant to hire a consultant to complete the JLUS with a local match of \$53,270.

A Request for Proposals was issued in the spring of 2017 with the award granted to Makers, an architecture, planning and urban design consultant based in Seattle. Makers has assembled a team that includes specialists in public participation, transportation and engineering. A kickoff meeting was held on September 13, 2017 with the Policy Committee. The project schedule has stakeholder and public involvement beginning in November with installation and community tours. There were a series of public meetings to discuss impacts of the installations and surrounding land use. A draft plan was presented to City Council in December of 2018 and was adopted by Resolution 2019-15 on April 16, 2019. Recommended strategies are organized into six categories including coordination, plan updates & policies, code updates & enforcement, land conservation, forest management, and education. The final version of the JLUS is available at <https://www.coconinojlus.com/>.

DEVELOPMENT IN LIGHTING ZONE 1

No new development projects have been submitted within the boundaries of Lighting Zone 1 since the last report.

City of Flagstaff Public Works Yard – Completed and occupied as of July 2018.

The City worked with the local dark sky community and the Naval Observatory to receive a \$250,000 grant from the Military Installation Fund for dark sky compliant lighting at the new public works yard located on the west side of Flagstaff on Route 66. The new facility is located in Zone 1, the most restrictive zone located closest to the Naval Observatory. The maximum allowable lumens for this 52-acre site is approximately 1.3 million lumens. A total of 796,582 lumens are proposed for the entire facility. Most of lighting fixtures are Narrow-Spectrum Amber LED (NSALED) light source. These fixtures are a mix of 90% NSALED and 10% white LED. Approximately 10% of the facility’s outdoor lighting use a white LED light source.

Timber Sky Phase 1 - Currently under construction with homes anticipated early next year.

Timber Sky is a 1,300 residential dwelling unit development with a mixture of high, medium, and single-family residential units combined with commercial service and open space on 197.58 acres located on West Route 66 in lighting zone 1. Working with the local dark sky community, the Timber Sky development committed

to a series of strategies as part of their Development Agreement with the City of Flagstaff. The Developer is responsible for the enforcement of these provisions through their Covenants, Conditions & Restrictions.

- Lighting for each single-family home developed within the R1, MR and HR zoning categories will be limited to a total of 1350 externally installed lumens, whether attached to the dwelling structure or installed elsewhere on the lot. This limit can be exceeded with the use of motion sensors on fixtures such that the non-motion sensor light fixtures do not exceed the 1350 lumens limit.
- Exterior lighting on single family and multi-family residential structures will be fully shielded fixtures to be installed under canopies or overhangs a minimum of five (5) feet from the nearest edge not attached to the structure. In situations where an overhang is not feasible or practical, a fully shielded fixture with motion sensor will be utilized.
- All common area property owned or managed by the master homeowner's association, or one of the sub-associations within a residential block, will be limited to security lighting and lighted entry monuments. For purpose of applying the City of Flagstaff lighting code, lighted entry monuments will be considered Class 1 Lighting, and security lighting will be considered Class 2 Lighting. Care must be given to minimize lumens and to direct light downward or be completely shielded for these applications.
- With the exception of lighting for single family residential, and lighting for multi-family residential all outdoor lighting will use "low-pressure sodium, narrow-spectrum amber LED, PC amber LED, or amber compact fluorescent or equivalent.
- Care should be given to selecting building colors and materials where external lighting will be installed to minimize reflectivity. Wall surfaces located below and within ten feet laterally of any external light fixture will have a "light reflectance value" (LRV) of 15 or less.

For commercial development within Block 12, Table 10-50.70.050.D of the City's lighting code requires outdoor lighting in Zone 1 to be turned off at 9:00 pm or no later than 30 minutes after the business closes, whichever is later. For any lighting fixtures exempted from this requirement in the lighting code, motion sensors will be utilized after 9:00 pm. The City of Flagstaff approved a modification to development standards to not require street lighting on the residential streets within this development.

COMMUNITY OUTREACH AND EDUCATION

In the past year, City staff have organized and participated in community outreach and education events throughout the City. The City of Flagstaff Sustainability program annual holds an event to celebrate our dark skies. Below is the flier for this event that was held on May 31, 2019. Code Compliance Staff participated in this event and provided information on outdoor lighting regulations and preferred lighting sources for Flagstaff.

Lights Out Flagstaff

Friday, May 31st, 2019

7:30 - 9:30 pm
Lights Out Celebration at Buffalo Park
Telescope Viewing, Night Sky Talks, and Kids Activity







www.flagstaff.az.gov/lightsoutflagstaff

Additionally, Code Compliance Staff has worked with and provided information to local groups on outdoor lighting regulations including the Downtown Business Alliance, Flagstaff Lodging, Restaurant and Tourism Association, University Heights Block watch, local homeowners' associations and the Code Enforcement League of Arizona. Below are educational materials provided by Staff to help communicate the outdoor lighting regulations.

Examples of Acceptable / Unacceptable Lighting Fixtures

Unacceptable / Discouraged

Fixtures that produce glare and light trespass

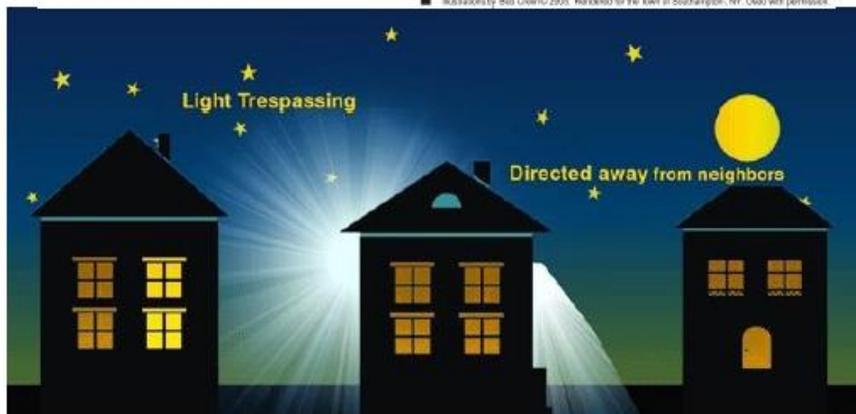


Acceptable

Fixtures that shield the light source to minimize glare and light trespass and to facilitate better vision at night



Illustrations by Bob Odeh © 2005. Reprinted for the Town of Southampton, NY. Used with permission.



Coming together as a community,
we can all play a role in protecting
and sustaining our dark skies.

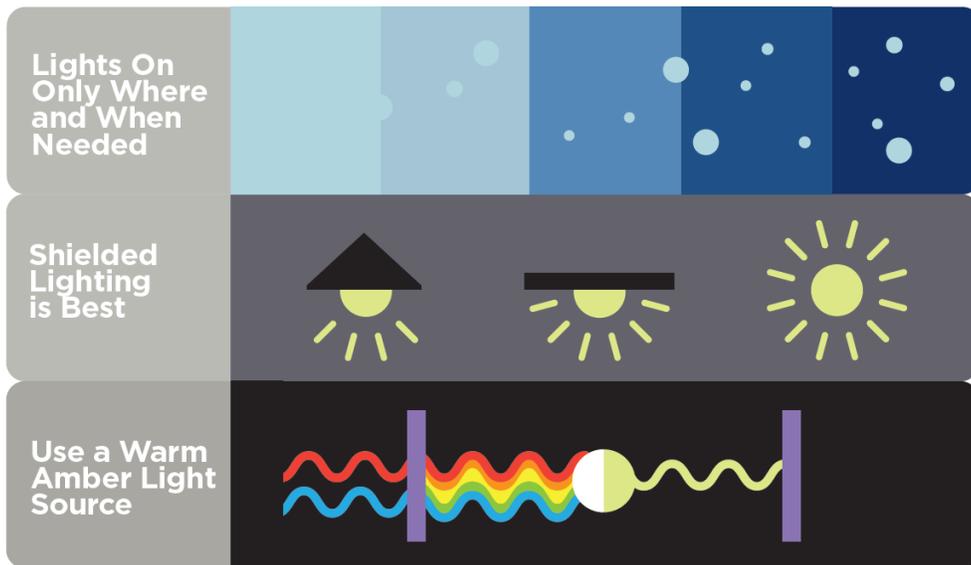
Working Together to Protect Flagstaff's Dark Skies

Why are Dark Skies so Important?

Long before recorded history, mankind was gazing up at the stars in wonder and trying to understand our place in the universe. Today, starlit dark skies are disappearing so quickly that less than 20 percent of the population can still see the Milky Way. And this tragic loss goes far beyond visual beauty. Light pollution disrupts the natural 24-hour day/night cycle and has proven negative effects on the physiological processes of plants, animals, and people. In the Flagstaff area, dark skies are also critical to area observatories—as famous for their public and tourism value as for their groundbreaking scientific contributions.

That's why we are so fortunate to be living in the world's first international Dark Sky City, globally recognized for our pioneering work in innovative lighting codes. Lighting codes balance the protection of Flagstaff's most unique resource with safe lighting practices that conserve energy and minimize artificial sky glow and glare.

Keeping Our Skies Dark



You Must Get a Permit Before Changing Light Bulbs or Fixtures



What do I need to do?

BUSINESSES AND INDUSTRY

New Construction: Outdoor lighting permits are required that define allowed lumens per acre

Existing Buildings: Permits are required before replacing any outdoor lighting bulb or fixture



www.flagstaff.az.gov/DocumentCenter/View/44090/Outdoor-Lighting-Application?bidId=



Outdoor Lighting Codes

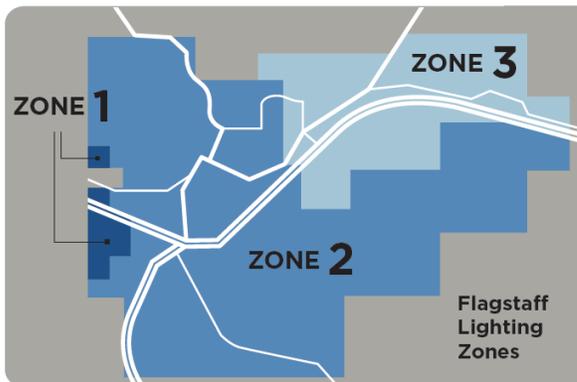
Flagstaff's protective regulations are designed to limit the adverse impacts of light pollution and apply to every building. These codes regulate three critical aspects of lighting hardware and systems:

- The amount of light
- The way light fixtures shield light
- The spectrum of light sources



All outdoor lighting fixtures must be installed to conform with Outdoor Lighting Standards 10-50.70 and the applicable building codes currently in effect in the City of Flagstaff. These regulations apply to:

- Existing buildings and uses
- New uses including buildings and major additions/modifications
- Minor additions/modifications such as changes in lighting
- Change of property use



Know Your Zone

Flagstaff's lighting zones have varying restrictions for larger-scale developments such as commercial, industrial, and multi-family housing complexes. Residential homes are limited to 10k000 lumens in all zones.

To learn what lighting is needed for your zone go to: www.flagstaff.az.gov/DocumentCenter/View/14494/Map10-9050-Lighting-Zone-Map?bidId=



Learn More

City of Flagstaff Community Development • 928-213-2618 • 928-213-2619
www.flagstaff.az.gov/DarkSkies

MEDIA RELATIONS

An article from the Arizona Daily Sun on September 17, 2019 about the City of Flagstaff Code Compliance and Planning efforts to reduce outdoor lighting violations.



Lowell approaches GODO de

The Giovale Open Deck Observatory is nearly complete

MATTAN OLSON
sun staff reporter

With just less than a month before the Giovale Open Deck Observatory makes its public debut, Lowell Observatory staff are moving on to the next phase of the Mars Hill master plan.

free admission will be offered all day. Each of the six new telescopes will be unveiled, one per night, in the week leading up to the opening.

In the master plan for the Mars Hill development, the open deck observatory is the first phase, followed by the Astronomy Discovery Center to replace the 15-year-old Shoemaker Visitor Center — which has exceeded its capacity — at the arrival and exhibit hub for guests.

"In the early 2000s when we signed the contract with Discovery Communications to build the

Festival of Science

Lowell Observatory will host various free presentations and an open house during the Flagstaff Festival of Science from Sept. 29-30, 2019. For a schedule of events, visit www.aafst.org/lowell.

Discovery Channel Telescope, that changed Lowell forever," Lowell historian Kevin Schmitke said.

He explained that meeting and

maintaining the \$10 million telescopes prompted the ongoing expansion of the observatory, which welcomed more than 100,000 visitors last year.

Although the Mars Hill campus sits on 710 acres owned by the nonprofit, Schmitke said the goal is not to develop it all.

"We're looking how to strategically take advantage of our resources and do it in a way that works with our community," he said. "We're making more space, but we also want to offer something really unique and inspiring,

something I think we'll have."

Open Dec

The open project has been in a transition, in that of its commencement dates, like from the boy looks it



Mark Steinko, the community code compliance officer for the City of Flagstaff, uses a white light spectrometer to take a reading from a fixture on a commercial business on Lead Scale 64.

City looks to better enforce lighting codes

ADRIAN CASILLAS
sun staff reporter

It was about 7:45 p.m. and already dark when City Code Compliance Officer Mark Steinko stood, spectrometer in hand, in the parking lot of one of the

down models along Route 64. The light cast from an overpass across the parking lot and Steinko tilted the spectrometer close to the bulb, taking a reading of the level and kind of light emitted.

For close to a year and a half,

Steinko has been going out about two nights a week, driving around Flagstaff as he measures the levels of light emanating from various businesses.

At this point, Steinko said, he almost doesn't need the

spectrometer — just by looking at a light, he can have a pretty good idea if it is out of compliance with the city's lighting codes and if it is damaging

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LINDSEY TAN
Associated P

CRITICAL in previous women we take extra precaution have had 1 condition, a The my hope, the a day called that didn't women who Almost I said that if a previous happened and the in your child Almost I who said voluntary due to a of them in processed like will.

"Any so possible somebody body in ve having an open" said Hawkins, an Medical he in the y based on news are program's more regular have had a second and women we perform a risk report double the

Lighting

From **A**

Flagstaff's dark skies.

Flagstaff has been known for its dark skies for some time, but in recent years, that darkness has been under attack.

"The biggest issues are really unshielded lights and then a lot of white light," City Planner Genevieve Pearthree said.

White light is particularly damaging to dark skies and has become more common with the increased use of LED lights outdoors.

Offering more energy efficacy, LEDs have started to replace older kinds of lights that emitted amber spectrums of light. Amber spectrums are less damaging to dark skies, said Lowell Observatory Director Jeffrey Hall.

It's not just the kind of light most LEDs emit that is a problem, but also the amount of light.

"White LEDs create much, much more sky glow, so that would obviously be ruinous here in Flagstaff," Hall said.

That light washes out night skies and makes seeing stars and other celestial objects far more difficult. And that's a problem for a community with millions of dollars' worth of observatories right on the edge of town, Hall said.

But Hall added that doesn't mean LEDs are all bad — if used properly, LEDs can be a powerful tool in protecting dark skies.

Some LEDs only emit a single spectrum of light, just like the older low-pressure sodium lights that were previously the city's standard. Because of this, as older lights become obsolete,

the city can preserve the same effect using narrow spectrum amber LEDs. LEDs can also better direct light to exactly what needs to be illuminated.

To help push these appropriate kinds of LEDs, the city, the county and Lowell Observatory are funding a joint two-year position for a lighting specialist meant to work full time on enforcing the lighting code.

That position has yet to be filled, but in the meantime, Stento has added lighting to the list of codes he works to enforce. As just one person, the issue of noncompliance is overwhelming.

Pearthree said noncompliance is not restricted to one part of the city or one population. Across the board, numerous commercial businesses and residences don't follow the city lighting code.

But by focusing their time and effort on the most egregious cases, Stento said they have already been able to reduce millions of lumens in light pollution.

Parking lots are often the worst contributors to light pollution, simply because of their scale. Stento said most of his time has been spent addressing commercial properties.

For example, according to a records request, the Walmart on East Huntington Drive is one case of a business currently out of compliance, although the store is working to correct the lights.

Stento said the city does its best to work with the businesses that light audits show are non-compliant. He said the businesses rarely know they are out of compliance.

Businesses and developments can become out of compliance when replacing lights after older ones burn out, or if a contractor installs the wrong lights even after a developer has created an approved lighting plan.

Because of this, after informing a business that they have the wrong kind of lights installed, Stento said the city does its best to work with the company to get the correct lights and the proper shielding.

Thus far, Stento said the city has not had to use any punitive measures to get businesses to comply.

When it comes to residential compliance, Stento said it will inevitably take more education and individual action.

"To maintain this, we will need voluntary compliance," he said.

Even though Flagstaff has been an official International Dark Sky City since 2001, City Code Compliance Manager Reggie Eccleston said until recently, the city hasn't had a good way of actually measuring the amount and kind of light emitted.

Mostly, that's because the technology to measure either the lumens or the spectrums of light emitted simply wasn't available in a practical way, said City Zoning Manager Dan Symer.

Instead, the city relied on making sure residents and businesses generally used the city's preferred kind of light bulbs, low-pressure sodium, and that lights were well shielded, Eccleston said.

Adrian Skabelund can be reached at the office at askabelund@azdailysun.com, by phone at (928) 556-2261 or on Twitter @AdrianSkabelund.

COMMUNITY PARTNERS & RESOURCES

Flagstaff Dark Skies Coalition

Our Mission: To celebrate, promote, and protect the glorious dark skies of Flagstaff and Northern Arizona through successful dark sky practices.

The Flagstaff Dark Skies Coalition website includes information on the Flagstaff Dark Sky program, lighting products and technical information on the science of lighting.

<http://www.flagstaffdarks skies.org>

Lowell Observatory

Our mission is to pursue the study of astronomy, especially the study of our solar system and its evolution; to conduct pure research in astronomical phenomena; and to maintain quality public education and outreach programs to bring the results of astronomical research to the general public.

Lowell Observatory was founded in 1894 by Percival Lowell. Since then, Lowell astronomers have discovered Pluto, collected the first evidence of the expanding Universe, and measured the motions and properties of stars, among many other achievements. Today, Lowell Observatory continues to do research in all areas of astronomy and share our discoveries with all.

<https://lowell.edu>

United States Naval Observatory Flagstaff Station

The mission of the U.S. Naval Observatory, Flagstaff Station, is:

- To make, analyze, and interpret such astrometric and photometric dark sky observations as are required to fulfill the mission of the U.S. Naval Observatory.
- To conduct a research program to improve the observational methods and the accuracy of astronomical data required by the Navy and other components of the Department of Defense.
- To perform such other functions or tasks as may be directed by higher authority.

Established in 1955 a few miles west of Flagstaff, Arizona, the Flagstaff station is the US Naval Observatory's dark-sky site for optical and near-infrared astronomy. There are presently two USNO sites in the Flagstaff area: this station (NOFS) and the Navy Precision Optical Interferometer (NPOI), located some 15 miles south of the city.

<http://www.nofs.navy.mil>

Exhibits

Date Received		Application for Outdoor Lighting Permit		Permit Number
Type of Lighting Permit:		<input type="checkbox"/> Permanent	<input type="checkbox"/> Temporary	
Site Address (including suite #)		City, State, Zip		
Property Owner		Phone	Email	
Mailing Address		City, State, Zip		
Applicant(s) or Contractor(s) (if different from property owner)		Phone	Email	
Mailing Address		City, State, Zip		
Parcel Numbers(s)		Parcel Zoning		

See Division 10-50.70 (Outdoor Lighting Standards) of the Zoning Code for City outdoor lighting standards.

Please contact the Planner of the Day if you have questions about this application. See <https://www.flagstaff.az.gov/150/Current-Planning> for more information.

SITE INFORMATION <i>(See City of Flagstaff Lighting Zones on p. 3 of this application for more information).</i>	
Lighting Zone (1, 2, or 3) _____	Site size in acres (provide to two decimal points, such as 10.25) _____
PURPOSE OF PROPOSED ILLUMINATION <i>(See section 10-50.70.050.B: Lighting Classes for more information).</i>	
Class 1 (White Light): Yes _____ No _____ <i>Used where you need to see color, such as building entrances, signs, outdoor eating and sales areas, workshops, recreation/sports fields.</i>	
Class 2 (General Illumination): Yes _____ No _____ <i>Used for pedestrian walkways, driveways, roadways, parking lots, equipment yards, and general outdoor security.</i>	
Class 3 (Decorative): Yes _____ No _____ <i>Examples include achitectural illumination, flag and monument lighting, landscape lighting.</i>	
<u>Your application must include all required components listed on p. 5. We do not accept incomplete applications. Please do not submit pages 5-8 (these are instructional/example pages).</u>	
_____ (Initials) I hereby certify that the information set forth on this form is complete and accurate and do hereby agree to comply with all applicable codes of the City of Flagstaff and the State of Arizona and with any conditions attached hereto, and request that all pertinent City personnel access my property at any time deemed necessary to inspect work being done relating to this permit.	

Applicant Signature:		Date:
For City Use		
Received By:		Fee Receipt #:
Approval: <input type="checkbox"/> Yes <input type="checkbox"/> No	Staff Initial:	Date Approved:

LUMEN CALCULATIONS TABLE: AFTER LIGHTING MODIFICATIONS

Provide the required information in the table below (or in a separate table that matches the table below) for each outdoor lamp and fixture combination that will be on site after the outdoor lighting is updated. Do not include streetlights in public rights-of-way. Some columns will auto-calculate, others you will need to fill out yourself.

1	2	3	4	5	6	7	8	9	10	11	12
Lighting Plan Symbol	Number of Fixtures	Lamp Type ¹	Shielding ²	Lighting Class (1,2,3) ³	Watts per Lamp	Lumens Per Lamp	No. of lamps per fixture ⁴	Lumens per Fixture	Number of Recessed Fixtures ⁵	Lumen Reduction for Recessed Fixtures ⁶	Lumens Total ⁷

Total proposed lumens _____ Maximum permitted total lumens⁸ _____
 Total proposed Class 1 and Class 3 lumens⁹ _____ Max. permitted Class 1 and Class 3 lumens¹⁰ _____
 Total proposed partially-shielded lumens _____ Maximum permitted partially-shielded lumens¹¹ _____
 Total proposed non-LED and non-NSALED lumens¹² _____ Total proposed LED and NSALED lumens¹³ _____

¹**Lamp Type.** Use the following abbreviations for lamp types:
CFL for compact fluorescent **IN** for incandescent **LED** for light-emitting diode (white or warm white)
FL for fluorescent **LPS** for low pressure sodium **NSALED** for narrow-spectrum amber LED
HPS for high pressure sodium **MH** for metal halide

²**Shielding.** Use the following abbreviations: **FS** for fully-shielded; **PS** for partially-shielded. *Unshielded fixtures are not permitted.*

³**Lighting Class.** *Class 1 (White Light)* is used to see color at building entrances, signs, outdoor eating and sales areas, workshops, recreation/sports fields, etc. *Class 2 (General Illumination)* is used for pedestrian walkways, driveways, roadways, parking lots, equipment yards, and general outdoor security. Low-pressure sodium (LPS) and narrow-spectrum amber LED (NSALED) lamps are used for Class 2 lighting. *Class 3 (Decorative)* includes architectural illumination, flag and monument lighting, landscape lighting.

⁴**No. of Lamps per Fixture.** Put 1 for LEDs or NSALEDs that are integrated as part of the fixture.

⁵**Number of Recessed Fixtures.** Applies only to fully-shielded fixtures at least 5-ft. (horizontally) from the nearest roof/canopy edge.

⁶**Lumen Reduction for Recessed Fixtures.** Do the following calculation for fixtures recessed 5-9.99 feet.: (Column 9 x Column 10) x 0.75. Do the following calculation for fixtures recessed 10 or more feet: (Column 9 x Column 10) x 0.90.

⁷**Lumens Total.** Do the following calculation: Column 2 x Column 9. For recessed fixtures only: (Column 2 x Column 9) – Column 11. See the *Example Permit* on p. 7 of this application for more information.

⁸**Maximum permitted total lumens.** Input the results of the *Maximum Permitted Lumens Worksheet* on p. 3 of this application.

⁹**Class 1 and Class 3 Lighting.** Includes CFL, FL, HPS, IN, and MH lamps listed in footnote 1 above. Class 1 and Class 3 lighting does not include Low-Pressure Sodium (LPS) or non-Narrow-Spectrum Amber LED (NSALED) lamps (these lamps are Class 2 lighting).

¹⁰**Maximum permitted Class 1 and Class 3 Lighting** cannot exceed 10% of the total permitted lumens for the site.

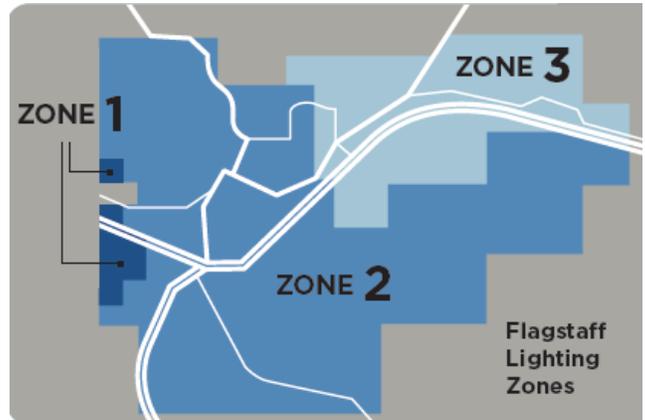
¹¹**Maximum partially-shielded lumens** cannot exceed the following in each zone. Zone 1: 0 lumens (partially-shielded lights are not permitted in Zone 1); Zone 2: 11% of total permitted lumens; Zone 3: 5.5% of total permitted lumens.

¹²**Total proposed non-LED and non-NSALED lumens:** Add the total lumens of all fixtures that *are not* LED or NSALED lights.

¹³**Total proposed LED and NSALED lumens:** Add the total lumens of all fixtures that *are* LED or NSALED lights.

MAXIMUM PERMITTED LUMENS WORKSHEET

1. Identify the Lighting Zone where your project is located. Refer to the Lighting Zone Map below or in Section 10-90.40.020 of the Zoning Code, or search by address in the GIS Mapping Portal <https://map-flagstaff.opendata.arcgis.com/> (go to the Flagstaff Zoning map).
2. Do the calculations for Step 1 below (multiply the maximum lumens permitted in your site's Lighting Zone by the net acres of your site). This is the maximum permitted lumens for your site if you are using no LED or NSALELED lights on your site. Move to Step 2 if you are using LED or NSALELED lights. See footnote 1 under the Lumen Calculations Table on p. 2 for more information lamp types.
3. Do the calculations for Step 2 below if you are using only LED or NSALELED lights on your site. This is the maximum permitted lumens if you are using only LED or NSALELED lights.
4. Do the calculations for Step 3 below if you are using LED, NSALELED, and other types of lights. See the *Example Permit* on p. 7 of this application for more information.



Maximum Permitted TOTAL Lumens

Zone 1: 25,000 lumens/acre **Zone 2:** 50,000 lumens/acre **Zone 3:** 100,000 lumens/acre

- **Step 1:** Maximum permitted lumens/acre for your Zone _____ x _____ site acres = _____ **maximum permitted lumens for the entire site (if using no LED or NSALELED lights)**
 - **Step 2:** Input results from Step 1 above _____ ÷ 1.43 = _____ **maximum permitted lumens for the entire site (if using only LED and/or NSALELED lights)**
 - **Step 3:** Input results from Step 1 above _____ - proposed non-LED/non-NSALELED lumens _____ = _____ ÷ 1.43 = _____ + desired non-LED lumens _____ = _____ **maximum permitted lumens for the entire site (if using both LED/NSALELED and other types of lights)**
-

ATTACH LIGHTING PLAN AND MANUFACTURER'S CUTSHEETS

ON THE BACK OF THIS PAGE

APPLICATION SUBMITTAL REQUIREMENTS

1. \$130 non-refundable fee due when submitting the permit application.
2. Complete p. 1 of this application.

One (1) copy of each of the following, on 8.5 x 11 or 11 x 17 sheets only. If the site is very large, you may use a bigger sheet for the lighting plan only.

1. Complete *Lumen Calculations Table: Before Lighting Modifications* (APPLIES ONLY TO EXISTING DEVELOPMENTS).
 - a. Lumen output per fixture is available on the manufacturer's cutsheets for the fixture.
 - b. If manufacturer's cutsheets are not available, estimate the lumen output by looking up the lamp type, make, and model number. Choose the highest estimate (most conservative) if there is a lumen output range.
2. Complete *Lumen Calculations Table: After Lighting Modifications*.
3. Complete *Maximum Permitted Lumens Worksheet*.
4. Complete outdoor *Lighting Plan* using corresponding symbols from the *Lumen Calculations Table*, clearly showing the location of all existing and proposed lighting (refer to example plan on p. 8 of this application).
5. The manufacturers' cutsheet for each fixture (or a picture of an existing fixture, if the cutsheet is unavailable).

ADDITIONAL INSTRUCTIONS: LIGHTING PLAN

1. Print an up-to-date aerial photo or draw a plan of the entire site. This document is known as the *Lighting Plan*.
 - a. Show the entire parcel and all property lines.
 - b. *Skip to Step 3 (below) if you plan to update all lighting (remove all existing lighting).*
2. Mark on the *Lighting Plan* the location of outdoor light fixtures that will remain on-site after the Outdoor Lighting Application is approved and the outdoor lighting on the site is updated. Include all light fixtures on the site—even those that are turned off or are inoperable.
 - a. If you do not want lights that are turned off or inoperable to count toward your maximum proposed lumens, you will need to remove them from the site.
3. For all lighting that will be on site after the permit is approved (includes new and existing lighting, if applicable):
 - a. Assign a different symbol (A,B,C or 1,2,3, etc.) to each unique lamp/fixture combination. The symbol on the lighting plan must correspond to the symbol on the *Lumen Calculations Table* on p. 3 of this application.
4. Identify any lights located five (5) or more feet (horizontally) from a roof eave or other type of canopy edge.
 - a. If so, measure the distance between the fixture and the edge of the roof, and record the distance on the lighting plan.
 - b. Include measuring tape in the picture if needed to clarify the distance between the edge of the fixture and the edge of the roof/canopy.

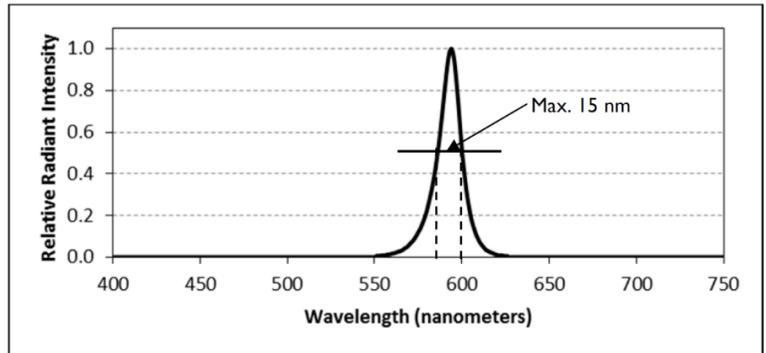
ADDITIONAL INSTRUCTIONS: MANUFACTURER'S CUTSHEETS

5. Include the manufacturer's cutsheet for each lamp/luminaire combination proposed in the permit application (each Lighting Plan symbol).
 - a. Label each cutsheet with Lighting Plan Symbol that it corresponds to.
 - b. If the cutsheet shows multiple options and/or models, clearly indicate which option you plan to install.
 - c. Make sure the cutsheet shows lumen output at installation, a picture of the fixture, model number, lamp type, and manufacturer.
 - d. For all Class 2 lights (low-pressure sodium or narrow-spectrum amber LEDs), the cutsheet should state the peak wavelength and include a graph that shows the wavelengths of light produced by the fixture (it should look like the graph on the top of p. 6).
6. Include a picture of each fixture type if cutsheets are unavailable. Label the lamp make and model number.

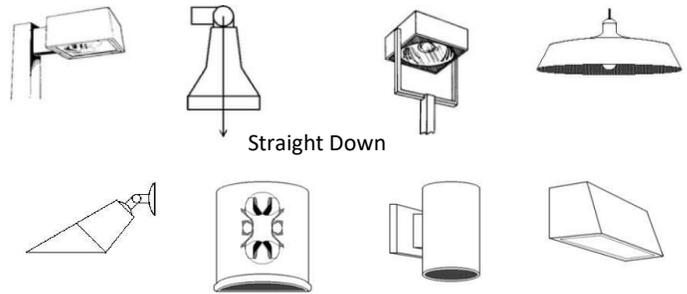
IMPORTANT INFORMATION ABOUT OUTDOOR LIGHTING REQUIREMENTS

Narrow-Spectrum Amber LEDs or Low-pressure sodium (LPS) (preferred lighting sources)

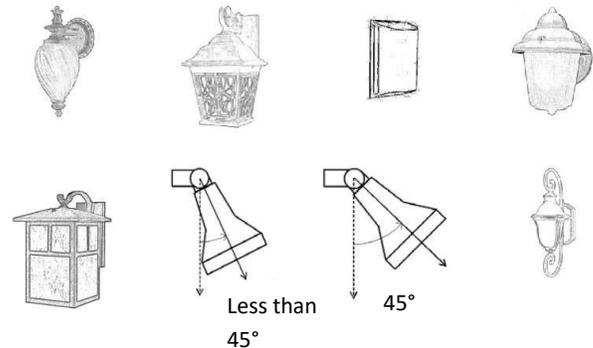
NSALEDs have a spectrum like that shown in the graph to the right, and with a peak wavelength between 585 and 595 nanometers and a full width at 50 percent power no greater than 15 nanometers. They are used for Class 2 lighting. See *Division 10-50.70.050: Requirements – All Lighting Zones* for more information.



Fully-Shielded Light Fixtures: All light emitted by the fixture must be projected below the bottom of the fixture. If the lamp or tube, any reflective surface, or lens cover is visible when viewed from above, directly from the side, or from any angle around the fixture or tube, the fixture or tube is not fully-shielded.



Partially-Shielded Light Fixtures: Most light is projected below the bottom of the fixture. Light emitted sideways or upwards arises only from incidental decorative elements or strongly colored or diffusing materials such as “honey” or colored glass or plastic. Fixtures using spot or flood lamps are considered partially shielded if the lamps are aimed no higher than 45 degrees above straight down (half-way between straight down and straight to the side).



No unshielded fixtures are permitted.

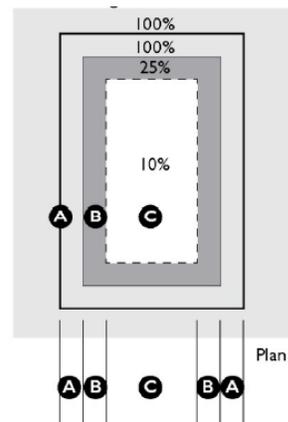
Fixtures eligible for a 75% reduction in total lumen output:

Applies to fully shielded light fixtures located within open parking garages, under canopies, building overhangs, or roof eaves, where *all parts of the light fixture are located between 5-9.99 ft. from the nearest outdoor opening, canopy, or overhang edge* (label B on the diagram to the right).

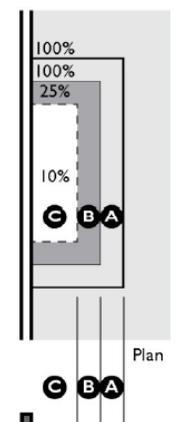
- Canopy Edge
- A ≤5' from Canopy Edge
- B 5'-10' from Canopy Edge
- C >10' from Canopy Edge

Fixtures eligible for a 90% reduction in total lumens output: Applies to fully shielded light fixtures located within open parking garages, under canopies, building overhangs, or roof eaves, where *all parts of the light fixture are located between 10 or more ft. from the nearest outdoor opening, canopy, or overhang edge* (label C on the diagram to the right).

Free-standing Canopy



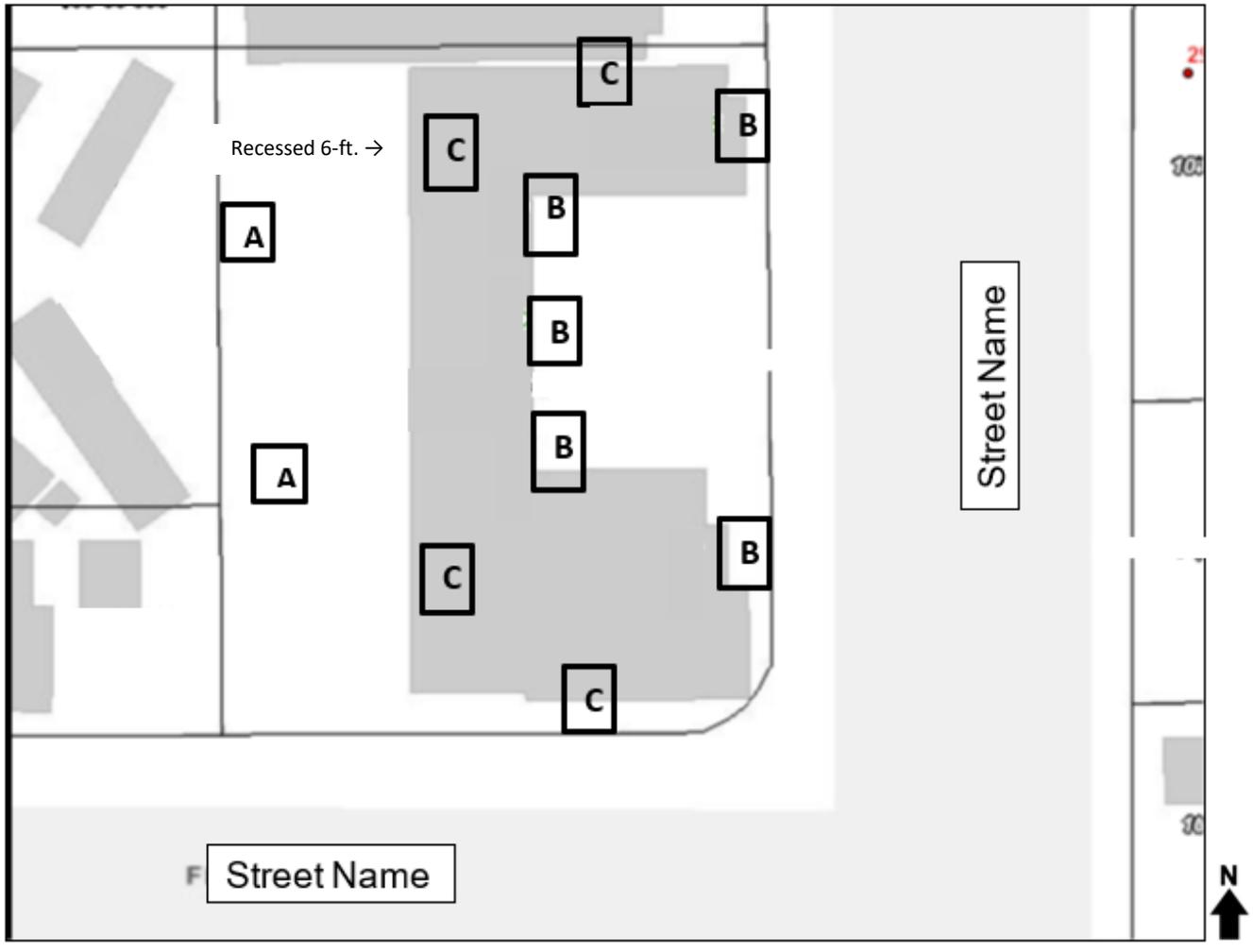
Detached Canopy



EXAMPLE OUTDOOR LIGHTING PLAN

Lighting Fixtures Count:

- A = 2 fixtures
- B = 5 fixtures
- C = 4 fixtures (one is recessed 5-9.99 ft.)



ATTACH MANUFACTURER'S CUTSHEETS ON THE NEXT PAGE

Permit Review, Archival, and Inspection Checklist

1. Use the Outdoor Lighting Permit Review Checklist to review the permit. Return until it meets all requirements.
2. For permits that have an associated building permit ONLY (all others should skip to step 3 below).
 - Confirm the lighting plan and proposed fixtures in the OLP match the electrical plan in the BP.
 - If they match, approve the BP with conditions in Innoprise, and add the standard comment for OLPs that have an associated BP.
 - If they do not match, you may do one of two things:
 - Preferred Option: Return the BP for corrections until it matches the OLP. This ensures that the BP field plan set that the contractor uses has the approved lighting.
 - Alternative Option: Approve the BP on the condition that they update the BP plan set when the OLP is approved. The risk is that the contractor may not have the approved lighting if they forget to do this. It also requires Building Safety to remove old sheet(s) and add new sheet(s).
3. Approve the OLP permit Innoprise with conditions.
 - Input the standard comments and any additional relevant comments.
 - Make sure to update the text in yellow capital letter sections so that it has the correct information.
 - Include relevant Additional Comments (lighting violation case, Use lights, or it has a BP, etc.).
4. Sign off on the paper copy of the permit.
 - Check the "Yes" box next to "Approval," and write your initials and the approval date.
 - Make sure the OLP has all required information on the title page (sometimes the resubmittals don't have all the information, such as the date, permit number, parcel number, zoning, etc.).
5. Scan the paper copy of OLP and all application components.
6. Attach the scanned OLP in Innoprise.
7. Put the paper copy of the permit in the OLP folder behind the front counter desk for the applicant to pick up.
8. Email the applicant to tell them that the permit is ready for a pick up. Include the following information:
 - A scanned copy of the approved permit application.
 - The approval conditions (they are easier to read in an email than on the permit cover sheet).
 - An installation deadline (only applicable to lighting violation cases). The deadline should be 60 days from the permit approval date, which should be the same date that you're sending the email.
9. For permits associated with projects that have a PZ number ONLY (they have a planning file):
 - Put a hard copy of the final approved permit into the planning file.
 - Remove any previous lighting approvals. The permit should clearly be the approved lighting plan.
10. Add an electronic copy of the cutsheets for any NSALED fixtures approved in this application that are not already in the approved fixtures folder. The folder is located here: \\ci.flagstaff.az.us\City-Share\SharedFiles\Community Development\Planning & Development\Zoning and Codes\Code Compliance\Lighting Ordinance\Outdoor lighting Resources\Acceptable Fixtures.
11. Make sure the applicant contacts Code Compliance when the lights are installed. For existing sites, the inspection is a regular inspection to close-out the permit. For new developments, it is to get a C of O.
 - Follow-up with the applicant if the lights are not installed within a reasonable timeline.
12. Have Code Compliance inspect the lights.
 - If the lights pass inspection, make sure Code Compliance does the following:
 - Inputs the inspection date and results in Innoprise.
 - Closes out the permit (goes the permit tab and updates the status to "approved").
 - If the lights DO NOT pass inspection, work with Code Compliance to address outstanding issues.
 - Have Code Compliance re-do the inspection once the issues are ready.
 - Complete the approval steps above once the permit passes inspection.

Outdoor Lighting Permit Review Checklist

Project Name: _____

Address: _____

Permit Number: _____

Step 1: Basic Completeness & Accuracy review. Return for corrections if any of these items are missing.

1. _____ Page 1 is complete, and the following are correct (if not, you can add/edit info if you know what is correct).
 - _____ The Lighting Zone is correct.
 - _____ The site acreage is correct. If the site covers more than one parcel, add up the acreage for all parcels.
 - _____ The Lighting Classes are correct.
 2. _____ Page 2 (*Lumen Calculations Table: Before Lighting Modifications*) is complete (if applicable).
 3. _____ Page 3 (*Lumen Calculations Table: After Lighting Modifications*) is complete.
 4. _____ Page 4 (*Maximum Permitted Lumens Worksheet*) is complete.
 5. _____ A lighting plan is included and readable.
 6. _____ Cutsheets are included, and each cutsheet lists the lighting plan symbol to which it corresponds.
-

Step 2: Lumen Calculations Table: Before Lighting Modifications (Page 2) – APPLICABLE ONLY TO EXISTING BUILDINGS

Check the accuracy of the inventory of existing lighting on-site. This information is needed to track pre- and post-lumens, and will be entered into Innoprise. If needed, Code Compliance can visit the site to confirm the inventory is accurate.

1. _____ The information in the table appears to be accurate.
 2. _____ The math for the lumens total for each lamp type is correct.
 3. _____ The math for the total existing lumens is correct (all types).
 - _____ The lumens total for each lamp taking a lumen reduction is correct (if applicable).
 - _____ Each fixture taking a reduction is eligible for a reduction (if applicable).
 4. _____ The math for the existing Class 1 and Class 3 lumens is correct (if applicable).
 5. _____ The math for the existing LED and NSALELED lumens is correct (if applicable).
 6. _____ The math for the existing partially-shielded lumens is correct (if applicable).
 7. _____ The math for the existing unshielded lumens is correct (if applicable).
-

Step 3: Maximum Permitted Lumens Worksheet (Skip to Page 4). Make sure the applicant is using the accurate maximum allowed lumens (depends on the LED to non-LED proportion).

1. _____ Step 1 is correct. This is the maximum permitted lumens if the applicant will use no LED or NSALELED lights.
 2. _____ Step 2 is correct. This is the maximum permitted lumens if the applicant will use *only* LED or NSALELED lights (this is often the case with new development or if the applicant is updating all the site lighting).
 3. _____ Step 3 is correct. This is the maximum permitted lumens if the applicant will use *both* LED/NSALELED and non-LED/non-NSALELED lights. See example on page 7 of the OLP application for information on how to do the math.
-

Step 4: Compare Manufacturer's Cutsheets to Lumen Calcs. Table: After Lighting Modifications, & Lighting Plan

1. _____ The lamp type listed on the cutsheet is correctly identified in the *Lumen Calcs. Table*.
2. _____ Each cutsheet for the lamps identified as NSALELED in the *Lumen Calcs. Table* includes BOTH* of the following:
 - _____ A statement of the peak wavelength (585 – 595 nanometers).
 - _____ A graph confirming the full width of the wavelength at 50 percent power is 15 nanometers or less (see LED, Narrow-Spectrum Amber in Section [10-80.20.120](#): Definitions “L” for more info).

**If the cutsheet does not provide this info, the applicant must provide either: 1) a cutsheet with this info; 2) letter from the manufacturer confirming the bulb meets City NSALELED requirements; or 3) a bulb for Code Compliance to test. If the light passes, they must include a copy of the spectrograph when resubmitting.*
3. _____ The applicant proposes an appropriate use of white light/Class 1 and Class 3 lighting (see: [10-50.70.050](#)).

- _____ White light (non-NSALED or non-LPS sources) does not exceed 10% of the maximum allowed lumens.
 - _____ If applicable, white light that exceeds 10% of the total allowed lumens allowed meets the requirements to be considered a special use in section [10-50.70.060](#): Special Uses.
 - 4. _____ Each cutsheet includes an image of the fixture to confirm that it is either fully- or partially-shielded.
 - _____ Shielding (FS or PS) is correctly identified in the *Lumen Calcs. Table*.
 - _____ The applicant confirms that all fixtures that are movable will be welded or fixed in place so that they are fully- or partially-shielded in perpetuity. If needed, you can get this in writing from the applicant.
 - 5. _____ Each cutsheets list the watts per lamp (note that LED cutsheets don't always list this info; that's okay).
 - _____ The watts per lamp is correctly identified in the *Lumen Calcs. Table*.
 - 6. _____ Each cutsheet lists the lumens per lamp (or fixture, for LEDs that are integrated into the fixture).
 - _____ The lumens per lamp is correctly identified in the *Lumen Calcs. Table* (if applicable).
 - 7. _____ The *Lumen Calcs. Table* identifies the lamps per fixture, e.g. flood lights/parking lot poles with multiple fixtures.
 - _____ The *Lumen Calcs. Table* accurately identifies the lumens per fixture (lumens per lamp X lamps per fixture, or lumens per fixture for LEDs that are integrated into the fixture).
 - 8. _____ The number of recessed fixtures is accurate because these lamps meet one of both these criteria:
 - _____ There is an accurate site plan shows fixtures are recessed at least 5 ft.
 - _____ There is a picture that clearly shows the lights are eligible for a reduction.
 - 9. _____ There are no unshielded lumens proposed. If so, require a switch to fully- or partially-shielded fixtures.
 - 10. _____ The applicant will not use prismatic lenses. If so, require a switch to a non-prismatic lens.
-

Step 5: Compare the Lighting Plan and the *Lumen Calculations Table: After Lighting Modifications*. Make sure the type and number of lighting plan symbols is consistent across the application.

- 1. _____ Lighting plan symbols are the same in the *Lighting Plan* & in the *Lumen Calcs Table: After Lighting Modifications*.
 - 2. _____ Number of fixtures for each lighting plan symbol is the same on the *Lighting Plan* and *Lumen Calcs. Table*.
-

Step 6: *Lumen Calculations Table: After Lighting Modifications (Go back to Page 3)*. Check the math for accuracy. Return if math is substantially wrong or the table is incomplete. You can redline minor corrections if you feel comfortable.

- 1. _____ Lumens total for each lamp type (column 12) is correct.
 - _____ The applicant accurately calculated the lumen reduction for eligible recessed fixtures (column 11).
 - _____ The value is 75% of the total lumen output for fixtures recessed 5 to 9.99 ft.
 - _____ The value is 90% of the total lumen output for fixtures recessed more than 10 ft.
 - _____ The lumen total (Column 12) for recessed fixtures is correct $([Column 2 \times Column 9] - Column 11)$.
- 2. _____ Total proposed lumens (below the table) is correct (sum of Column 12).
- 3. _____ Total proposed Class 1 and Class 3 lumens is correct (sum of all lumens for Class 1 and Class 3 lighting).
- 4. _____ Total proposed partially-shielded lumens is correct (sum of all lumens produced by lamps listed as PS).
- 5. _____ Total proposed non-LED and non-NSALED lumens is correct (sum of lumens from CFL, FL, HPS, IN, LPS, or MH).
- 6. _____ Maximum permitted total lumens is correct (it matches the results from the *Maximum Permitted Lumens Worksheet on page 4*). See Step 3 on the previous page for more info.
- 7. _____ Max. permitted Class 1 and Class 3 lumens is correct (it is 10% of maximum permitted total lumens).
- 8. _____ Max. permitted partially-shielded lumens is correct (Zone 2: 11% of max. lumens; Zone 3: 5.5% of max lumens)
- 9. _____ Total proposed LED and NSALED lumens is correct.

Application is within maximum permitted lumens. Return for corrections if proposed lumens exceed permitted lumens.

- 1. _____ Total proposed lumens are less than the maximum permitted total lumens.
- 2. _____ Total proposed Class 1 and Class 3 lumens are less than the maximum permitted Class 1 and Class 3 lumens.
- 3. _____ Total proposed partially-shielded lumens are less than the maximum permitted partially-shielded lumens.

Standard Approval Comments

Copy and paste the comments into Innoprise, and input the correct information into the **yellow capital letter sections**. Include the Additional Comments at the end of this section if they are relevant.

Standard Comments

The Planning and Development Services Section, in accordance with Section 10-50.70 of the City of Flagstaff Zoning Code (Outdoor Lighting Standards), has approved the request of **[INSERT NAMES OF PROPERTY OWNER AND APPLICANT]** for an Outdoor Lighting Permit for **[INSERT BUSINESS NAME]** at **[INSERT ADDRESS]** in **[INSERT LIGHTING ZONE]** and in **[INSERT ZONING DISTRICT]**, subject to the following conditions:

- 1) Approval is based on the information contained in the lighting plan, lumen calculations table, and manufacturer's cutsheets included in the application.
- 2) Lighting shall be installed per the approved plans included in this permit application. Any modification to the approved lighting now or in the future beyond routine maintenance and the replacement of burned out bulbs with the same type of bulbs shall be approved through a new Outdoor Lighting Permit prior to installation. These modifications include, but are not limited to, substitution of an existing fixture with a different fixture type, modification of the light source, changing the light type, relocation/removal of light fixture, addition of a new light fixture, etc.
- 3) No light fixtures shall use prismatic lenses.
- 4) The total lumen output of all outdoor lighting shall be no higher than the maximum allowed for the parcel.
- 5) The lumen output of all non-low-pressure sodium/non-narrow spectrum amber LED lights shall be no higher than the maximum non-LPS/non-NSALED lumens allowed per parcel.
- 6) All light fixtures shall be fully or partially-shielded; no unshielded fixtures are permitted.
- 7) All fixtures listed as fully-shielded on the lighting plan and lumen calculations table shall point straight down, and the lamp shall be fully-recessed inside the fixture, so that they meet the definition of a fully-shielded fixture per the City of Flagstaff Zoning Code. Movable fixtures shall be welded so that they point straight down and meet in perpetuity the requirements to be considered fully-shielded.
- 8) All fixtures listed as partially-shielded on the lighting plan and lumen calculations table shall be aimed no higher than 45 degrees above the horizon line so that they meet the definition of a partially-shielded fixture per the City of Flagstaff Zoning Code. Movable fixtures shall be welded so that they meet in perpetuity the requirements to be considered partially-shielded
- 9) The lumen output of any partially-shielded fixtures (if applicable) shall be no higher than the maximum partially-shielded lumens allowed for this parcel.
- 10) There shall be no light trespass onto adjacent private property or onto public right-of-way. All light fixtures, including security lighting, shall be located, aimed and shielded so that the direct illumination from the fixture shall be confined to the property boundaries of the source. Lights located close to the exterior of the property shall install an external shield if needed to prevent light trespass. Any light fixture with an output over 10,000 lumens located within 50 feet of any residential (including multifamily residential) property or public right-of-way shall utilize an internal or external shield, and the light fixture and shield shall be oriented to minimize light trespass over the adjacent property or right-of-way line. If an external shield is used, its surface must be painted black to minimize reflections.
- 11) All components of each light fixture taking a 75% reduction in lumen output (if applicable) shall be at least 5-ft. (horizontally) from the nearest roof eave or canopy edge. All components of each light fixture taking a 90% reduction in lumen output (if applicable) shall be at least 10-ft. (horizontally) from the nearest roof eave or canopy edge.
- 12) Final approval of this Outdoor Lighting Permit is dependent on a successful inspection of outdoor lighting. Upon completion of permitted work please schedule an inspection by calling Code Compliance at 928-213-2147 or emailing codecompliance@flagstaffaz.gov. Please leave your name, site address, contact number and permit number when requesting an inspection.

Additional Comments

This permit is associated with a Lighting Violation Case

13) All lighting approved under this permit shall be installed within 60 days of the permit approval date (weather permitting). The permit approval date is [INSERT DATE] and the installation deadline is [INSERT DATE]. Contact Mark Stento, Code Compliance Officer II, at 928-213-2148 or mstento@flagstaffaz.gov if you anticipate any delays. Please be advised that because this permit stems from an Outdoor Lighting Violation case [INSERT CASE NUMBER], failure to install the lighting by the installation deadline could result in a Notice of Violation and accompanying citations.

This permit has lighting deemed to be a Special Uses (see section 10-50.70.060: Special Uses)

13) The non-LPS/non-NSALED lumens exceed the standard maximum (10% of the total allowed lumens) because they meet the requirements to be considered a Special Use (see section [10-50.70.060](#) of the City of Flagstaff Zoning Code). These lumens [INSERT AMOUNT OF NON-LPS/NON-NSALED LUMENS THAT EXCEED 10%] are used for [INSERT SPECIAL USE]. The applicant may add more non-LPS/non-NSALED lumens to the site in the future with an approved Outdoor Lighting Permit if one of the following conditions are met: 1) all non-LPS/non-NSALED lumens that do not qualify as a Special Use shall not exceed 10% of the maximum allowed lumens for the site, and the total lumen output does not exceed the maximum allowed lumens for the site; or 2) the total lumen output of all outdoor lighting, including non-LPS/non-NSALED lumens that qualify as a special use, does not exceed the maximum allowed lumens for the site.

This permit has an associated Building Permit (it is a new development or a substantial remodel that requires a BP)

13) This Outdoor Lighting Permit [INSERT PERMIT NUMBER] has an associated Building Permit for this project [INSERT PERMIT NUMBER]. Should there be any discrepancies in the information provided in this Outdoor Lighting Permit and in the associated Building Permit, this Outdoor Lighting Permit supersedes any outdoor lighting information contained in the associated Building Permit.



APPENDIX A IMPLEMENTATION STRATEGIES

IMPLEMENTATION STRATEGIES

The 28 strategies in Chapter 3 are summarized in the following matrix and include priority level, anticipated time frame, and a rough estimated cost.

STRATEGY MATRIX

KEY

PRIORITY	1 = High 2 = Medium 3 = Low
ANTICIPATED TIME FRAME	I (Immediate) = first 2 years; I/O (Immediate/Ongoing); O (Ongoing) = ongoing; N (Near Term) = first 3 years; M (Medium Term) = 6-10 years
ESTIMATED COSTS	\$ = less than \$10,000; \$\$ = \$10,000 to \$50,000; \$\$\$ = greater than \$50,000

STRATEGY	Priority	Primary Responsible Party(ies)	Secondary Responsible Parties	Anticipated Time Frame	Estimated Cost	Potential Funding Source
COORDINATION						
1 Establish a JLUS Implementation Committee and Memorandum of Understanding (MOU) to oversee JLUS strategy implementation.	1	County	City, Camp Navajo, NOFS, JLUS stakeholders	I	\$	Staff time
2 Improve notification and coordination between Coconino County, Flagstaff, NOFS, and Camp Navajo around potential land use activities and development projects in the study area.	1	City, County	NOFS, Camp Navajo	I	\$	Staff time
3 Coordinate with NOFS and Camp Navajo during regional, comprehensive, activity center, and other plan updates in the study area.	1	City, County	NOFS, Camp Navajo	O	\$	Staff time
DARKSKIES						
4 Establish an Outdoor Lighting Committee that meets regularly to help oversee: - Lighting code updates (approval process, code writing, communication/outreach, etc.). - Public relations campaign as outlined in strategy #26. - Ongoing information sharing between local observatories, City and County permitting, and code enforcement staff, so this occurs independent of individuals assigned to positions. - Completion and ongoing updates of a dark sky compliant fixture list and design guidance for homeowners and developers. List to be posted and disseminated as part of outreach strategy #26.	1	City, County	NOFS, Lowell, Dark Skies Coalition	I/O	\$	Staff time, volunteer time
5 Formalize communication between the USFS, Camp Navajo, and NOFS to minimize impacts of prescribed burns on NOFS mission.	1	USFS, Camp Navajo, NOFS	County, NAU	I	\$	Staff time
6 Designate a local Community Planning Liaison Officer (CPLO) to serve as NOFS's mission advocate and dark sky expert.	1	NOFS		I	\$\$\$	DoD / U.S. Navy

STRATEGY	Priority	Primary Responsible Party(ies)	Secondary Responsible Parties	Anticipated Time Frame	Estimated Cost	Potential Funding Source
FOREST MANAGEMENT						
<p>7 Support effort to site a wood processing plant within the JLUS Study Area and coordinate to:</p> <ul style="list-style-type: none"> - Support the ongoing Biomass Feasibility Study in evaluating potential extent of and ability to mitigate for air quality and thermal impact on NOFS mission. - Build a proactive, robust framework to address air quality, water quantity and quality, and traffic impacts in the area. - Work with ADEQ to identify opportunities to leverage environmental analysis, outreach, and permitting process to increase knowledge of local aquifer health. - Explore options to use sustainable practices such as installing a closed-loop reclaimed water system. 	1	Camp Navajo, NOFS	County, ADEQ, AZDWR, USFS, Wood Processing Plant Developers	I	\$	Staff time
TRANSPORTATION						
<p>8 To support development of an appropriately-sized interchange bridge in Bellemont:</p> <ul style="list-style-type: none"> - Continue to advocate for and identify funding for increased capacity and multi-modal improvements to the interchange bridge. - Consider suggesting having bridge designed for five lanes but be built with three lanes in the near term. 	1	JLUS PC, County, ADOT	Camp Navajo, AZDEMA, ADOT, area businesses	I/O	\$-\$\$\$	Staff time, private enterprise, AZDEMA, Coconino County, ADOT
<p>9 Coordinate proactively with ADOT to ensure projects consider area growth plans and lighting along roadways is dark sky compliant and work to address:</p> <ul style="list-style-type: none"> - Transition of lighting in the study area to dark sky compliant - Planning and design of study area projects to ensure they support planned development, incorporate dark sky lighting, and enhance wildlife crossings. 	2	ADOT, Dark Skies Coalition	Camp Navajo, NOFS, County, City, AGFD, ASLD, NAU, FMPO, NACOG	O	\$	Staff time

STRATEGY	Priority	Primary Responsible Party(ies)	Secondary Responsible Parties	Anticipated Time Frame	Estimated Cost	Potential Funding Source
PLAN UPDATES & POLICIES						
10 Support existing and adopt new goals and policies to best protect the missions of Camp Navajo and NOFS in the County's and City's Comprehensive Plan update.	1	City, County	NOFS, Camp Navajo	N	\$	Staff time
<i>DARKSKIES</i>						
11 Support adoption of the draft dark skies goals and policies in the Bellemont Area Plan.	1	County	NOFS	I	\$	Staff time
12 Prioritize development of designated activity center plans (specifically activity centers S10, U7, and S11 in the west).	1	City, County	NOFS, Camp Navajo, Lowell	N	\$\$\$	City, potential OEA funds
13 Support development of a Camp Navajo policy to comply with current and future Zone 1 lighting standards in order to protect dark skies.	2	Camp Navajo, Corps of Engineers	Dark Skies Coalition, NOFS	N	\$	Staff time
14 Recognizing dark sky regional assets, especially given the potential telescope location on Volunteer Mountain, adopt dark sky goals and policies in Williams.	2	Williams	NOFS, Camp Navajo, County	N	\$	Staff time
<i>ENVIRONMENTAL HEALTH</i>						
15 Understanding the important link between wildlife and land conservation, incorporate wildlife corridors into planning documents and land conservation efforts.	2	City, County	ADOT, Camp Navajo, AGFD, USFS, Central AZ Land Trust	O	\$	Staff time
<i>TRANSPORTATION</i>						
16 Update the 2015 Bellemont Access Management & Multimodal Study to account for potential growth as part of Camp Navajo and adjacent properties on the south side of I-40.	1	County	ADOT, Camp Navajo	I	\$\$-\$\$\$	Staff time; potential OEA funds; County

STRATEGY	Priority	Primary Responsible Party(ies)	Secondary Responsible Parties	Anticipated Time Frame	Estimated Cost	Potential Funding Source
CODE UPDATES & ENFORCEMENT						
<i>CITY & COUNTY LIGHTING CODE</i>						
17 Periodically review and revise lighting codes to meet emerging technologies, similar to the ongoing process to incorporate the following NOFS Mission Compatibility Light Pollution Study code recommendations: - Update design standards to encourage/require overhang or canopy-mounting for outdoor lighting in Lighting Zone 1. - Extend Flagstaff's lighting zone 2 to cover all of existing zone 3. - Modernize measurement of absolute lumens. - Update residential roadway lighting requirements (consider making roadway lighting optional or eliminating requirement). - Align residential average use standard (consider allowing up to 10,000 lumens installed if average annual usage does not exceed 1,500 lumens).	1	City, County	Lighting Code Working Group, Outdoor Lighting Committee, NOFS, Dark Skies Coalition, Lowell	I	\$	Staff time
<i>CITY & COUNTY ZONING CODE</i>						
18 Continue to move toward City and County adoption of SLEDS Study recommendations for dark sky friendly lighting in the public right-of-way.	1	City, County	NOFS, Dark Skies Coalition, Lowell, Developers	I	\$	Staff time
ENFORCEMENT						
19 Fund a joint Coconino County and City of Flagstaff lighting specialist positions for education/enforcement in the next fiscal year (Spring 2019), responsibilities for this position include: - Establishing baseline database of non-conforming lights and a program/work plan to review problem parcels, updated annually. - Refining enforcement practices and policies to bring non-compliant fixtures into compliance with dark sky standards. - Convening an education series for elected officials, local leadership, staff, and community. - Providing periodic trainings for developers, realtors, design and building professionals, and existing property owners. - Creating a volunteer Dark Sky Ambassador Program and training volunteers to conduct outreach and education. - Leading efforts to develop training and education materials, such as presentations, fact sheets for permit applications and other uses, specification sheets, and outreach materials.	1	City, County	NOFS, Dark Skies Coalition, Lowell	N	\$\$\$	City, County, potential OEA funds (baseline database; education & training materials development), volunteer time (Dark Sky Ambassadors)

STRATEGY	Priority	Primary Responsible Party(ies)	Secondary Responsible Parties	Anticipated Time Frame	Estimated Cost	Potential Funding Source
LAND CONSERVATION						
<p>20 Continue to pursue funding to conserve critical private land in study area:</p> <ul style="list-style-type: none"> - Continue to pursue ACUB & REPI program funding and partnerships to limit development on priority parcels in the study area. - Continue to coordinate with Trust for Public Land, the Nature Conservancy, and other NGOs to seek funding opportunities and expertise around priority parcel acquisition and conservation easements. - Explore partnering with the USDA National Resources Conservation Service. 	1	Camp Navajo, NOFS	County, City, NGOs (i.e. TPL & Nature Conservancy), Central Arizona Land Trust, AGFD	O	\$\$\$	REPI/ACUB, AZDEMA, DoD/Navy
<p>21 Continue to pursue funding to conserve critical Arizona State Trust Lands in the study area and advance one or more of the following:</p> <ul style="list-style-type: none"> - Continue to advocate and educate regarding the importance of conservation of Centennial Forest and other ASLD study area parcels to the NOFS and Camp Navajo mission. - Explore amending state constitution to make potential land swaps for military protection more feasible. - Explore opportunities to reinvigorate the Arizona Preserve Initiative (API), with milestones and performance measures to designate critical parcels for conservation, and fund acquisition of Centennial Forest and/or other priority parcels (potentially using REPI/ACUB funds) - Identify and pursue other opportunities to protect critical State Trust land parcels in the study area. 	1	NOFS, AZDEMA, ASLD	NAU, NGOs (i.e. TPL & Nature Conservancy), County, AGFD	O	\$	Staff time
<p>22 Work with AZ legislature to revitalize the Military Installation Fund by:</p> <ul style="list-style-type: none"> - completing a statewide prioritization of parcels, and - granting the Military Affairs Commission the authority to make offers on land. 	3	AZDEMA	County	M	\$	Staff time

STRATEGY	Priority	Primary Responsible Party(ies)	Secondary Responsible Parties	Anticipated Time Frame	Estimated Cost	Potential Funding Source
FOREST MANAGEMENT						
<p>23 Support County Forest Restoration Director in efforts to coordinate forest restoration activities. Responsibilities that support JLUS goals include:</p> <ul style="list-style-type: none"> - Assisting NOFS in developing processes for communication regarding prescribed burns and visibility. - Developing materials and outreach plan to educate community on the importance of thinning and address sensitivity around "healthy" forest image. - Consider creation of a Resource Protection Overlay (RPO) zone in the county, similar to the City of Flagstaff's overlay, that integrates tree protection provisions supporting dark skies with appropriate thinning practices to promote forest health. - Explore the opportunity to expand forest thinning contracts in the study area to include private lands and State Trust land. - Exploring the opportunity to use "hot shot" crews or forestry students to assist with forest thinning in the study area. 	2	County	USFS, NOFS, Camp Navajo, ASLD, NAVFAC, NAU	M	\$	Staff time
<p>24 Improve practices to reduce wildfire risk on Camp Navajo with the following:</p> <ul style="list-style-type: none"> - Update Camp Navajo's safety management practices to include wildfire aversion measures. - Set up a system to communicate to trainees/visitors. - Continue to conduct forest restoration activities to improve operations and reduce the threat of high-severity wildfire. 	1	Camp Navajo		I	\$	Staff time
<p>25 Support forest restoration activities outside of installations to reduce the threat of high-severity wildfire in the study area.</p>	3	NAU, USFS	JLUS Stakeholders	M	\$	Staff time

STRATEGY	Priority	Primary Responsible Party(ies)	Secondary Responsible Parties	Anticipated Time Frame	Estimated Cost	Potential Funding Source
EDUCATION						
<i>DARKSKIES</i>						
<p>26 Develop and execute a public relations campaign to increase dark skies awareness and encourage action that could include:</p> <ul style="list-style-type: none"> - Developing web-based and other resources to assist the public with dark sky compliant lighting implementation, include FAQs, and elements that build awareness/encourage replication of regional best practices and successes. - In coordination with military Public Affairs Officers, creating dark sky brochures for City and County staff to share with the public. - Supporting efforts to amend area Homeowners Associations' (HOAs) governing documents to implement dark sky compliant lighting. - Posting and advertising the dark sky compliant fixtures, brands, and design guidance developed in strategy #4 to assist suppliers, developers, and the public in meeting standards. 	1	Dark Skies Coalition, NOFS, Lighting Code Working Group	County, City, Lowell	N	\$\$-\$	Staff time, potential OEA funds
<i>MILITARY INSTALLATIONS</i>						
<p>27 Organize and launch initiatives to increase the general public's understanding of military operations, economic contributions, and the importance of compatibility. Efforts could include:</p> <ul style="list-style-type: none"> - Issuing more frequent and user-friendly communications from the bases through newsletters, website updates, press releases, social media, and in person attendance at events and meetings. - Developing tools, presentations, and illustrations to increase general awareness of military missions, economic contribution, and importance of compatibility in the state. 	3	AZDEMA		M	\$	Staff time
<p>28 Work with AZ legislature to notify property owners within certain distances of military installations.</p>	3	AZ Military Affairs Commission	AZDEMA	M	\$	Staff time

