Memorandum

TO: Kevin J. Jackson, Village Manager

FROM: Lindsey Roland Nieratka, Chief Sustainability Officer

FOR: Village President and Board of Trustees

DATE: September 18, 2024

SUBJECT: **Village of Oak Park Nighttime Lighting Environment Report**

Purpose

The purpose of this memo is to provide information related to the Nighttime Lighting Environment Report commissioned and reviewed by Village staff and presented to the Environment and Energy Commission.

Background

The Village contracted with Ken Walczak, Senior Manager of the Adler Planetarium, to complete a nighttime lighting environment study of the Village of Oak Park. The results of the study were compiled into the attached Village of Oak Park Nighttime Lighting Environment Report.

The Nighttime Lighting Environment Report addresses CROP Action PE03: Conduct a light pollution mitigation study and integrate design and practices to reduce the impacts of refuge light on wildlife, especially bird, bat, and insect populations, and humans.

The Environment and Energy Commission (EEC) 2024 work plan included a "Biodiversity Program" with the goal to propose exterior lighting ordinance recommendations to the Board of Trustees. To further this goal, Mr. Walczak presented the report and included recommendations to the EEC at its September 3, 2024 meeting.

The first of the report's recommendations suggest addressing outdated municipal lighting. The study did not do a complete lighting inventory but found that most – more

than two-thirds of the Village-owned lighting technology meets International Dark Sky standards. Staff indicated that much of the lighting that does not yet meet the standards is scheduled for upgrades in the next few fiscal years.

Recommendations two and three in the report suggest addressing residential and commercial lighting through the creation of an ordinance and continued education on lighting impact and best practices. The EEC asked for Mr. Walczak to provide examples of effective ordinances or policies for their review at a future meeting. The EEC plans to evaluate these examples to inform a policy for recommendation to the Village Board and will include developing these recommendations in the 2025 work plan.

Next Steps

The EEC will continue its evaluation of examples of effective ordinances and policies at a future meeting and is expected to follow up with recommendations that will be brought forth to the Village Board.

For questions, contact Lindsey Roland Nieratka, Chief Sustainability Officer, via email at lnieratka@oak-park.us or by phone 708-358-5785.

Attachments

1. VOP Nighttime Light Environment Report

cc: Lisa Shelley, Deputy Village Manager
Ahmad Zayyad, Deputy Village Manager
Erin E. Baynes, Assistant to the Village Manager
Christina M. Waters, Village Clerk
All Department Directors

Village of Oak Park Nighttime Lighting Environment Report

May 7, 2024

Ken Walczak

Board Member, DarkSky International
Associate Member, Illuminating Engineering Society (IES)
Senior Manager, Adler Planetarium

Report Summary

Background

Excessive and uncontrolled artificial light at night (ALAN) has known and measurable impacts on ecological systems and human health. In addition, wasted or poorly utilized light is a significant source of preventable greenhouse gas emissions. The purpose of this study is to help determine the state of the lighting in Oak Park in regards to its effectiveness, ecological sustainability and efficiency.

It is estimated light pollution is growing at a rate of nearly 10% annually. Research has shown that unregulated ALAN is a stressor on ecosystems and human health. Light pollution is a significant cause of migratory bird fatalities, disruptor of insect ecosystems and the health of urban florae. Much of the most recent growth of light pollution can be attributed to the advent of inexpensive yet highly efficient LED technology and, most importantly, the harmful applications of that technology which can negatively impact not only the night skies but also the safety, health and the environmental sustainability of the Village.

On the positive side - paraphrasing light pollution researcher Kevin Gaston - "All other forms of pollution are costly to remediate. Light pollution is costly to maintain."

Results

The lighting in the Village of Oak Park stands in stark contrast to its neighbor to the east which may be attributable to a greater tree canopy and/or use of dark sky responsible alley lighting among other factors (Detailed information on the regional light pollution context is provided on pages 5-10). There remain many ways beneficial improvements can be made. The ecological, health, safety, economic and environmental impacts generated by the existing lighting would benefit by being addressed. A substantial portion of the municipal lighting inventory suffers from various issues such as; old technology, insufficient shielding, inefficient light distribution and lack of proper controls. There are numerous examples of commercial properties producing significant glare, excess light or uncontrolled up light. Although limited, there are also cases of unadvised landscape lighting at some residential properties.

Recommendations

- Address outdated and/or inefficient municipal lighting based on the IES/DarkSky recommended 5 Principles of Responsible Outdoor Lighting.

- Move to create ordinances that remediate and prevent commercial and residential lighting that have demonstrable negative impacts to improve the quality of life of all residents of Oak Park and the health of its environment.

- Promote the awareness of the harms of light pollution and the benefits of quality lighting for the public and people of Oak Park with education and engagement.

Methods

Using data provided through remote sensing of nighttime lights, the light emissions of Oak Park were quantified and identified. A GIS inventory of municipal controlled lighting was used to help analyze the state of the existing infrastructure.

On the nights of April 19 and 21, 2024 I visited the Village of Oak Park to perform a survey of the nighttime lighting to assess the state of the lighting affecting the nighttime environment. I collected observations from various locations of interest, toured the Village and collected photographic and photometric readings at multiple sites.

I collected a number of observations including calibrated photographs, illuminance readings and light spectra. Some of the details reported are:

Luminance - a measure of the fixture's "light output" or "brightness" in the *direction of observation*. Although this number indicates the amount of light energy emitting from a source, this is not the same as lumens. Lumens are the *total* light output of a luminaire in all directions.

Illuminance - a measure of light falling on a surface or at a location. Typically measured in foot-candles (fc) or lux. This is a common parameter used to quantify light trespass and appropriate lighting levels on a surface requiring light.

Color Temperature - a representation of the color composition of a light. Measured in Kelvins (K), this number can help determine the amount of bluer light - the most detrimental color of the spectrum - emanating from a light. The higher the Kelvin temperature, the bluer the light. DarkSky International and the American Medical Association recommend outdoor lighting not to exceed 3000K.

Color Rendering Index (CRI) - a scientifically derived number from 0 to 100 that indicates how well the human eye can distinguish colors under that light. The higher the number the better the eye can identify a full range of colors.

S/P Ratio - the Scotopic to Photopic ratio is a number that represents the efficiency of a light source for human nighttime vision. A source with a high S/P ratio would require less lumens than one with a lower ratio to achieve the same visual response.

Instruments

In the evaluation of the lighting and their effects on the local environment, the following instruments were used:

Sper Scientific 840022 Illuminance Meter - This device measures the quantity of light falling on a surface in lux. It can help determine whether proper light levels are met and quantify the amount of light trespass.

OHSP-360 Spectral Illuminance Meter - This device is used to measure the spectra of light sources as well as their illuminance (lux), color temperature (K), color rendering index (CRI) and other photometric details.

Canon M6 digital camera - A 24MP digital camera, set to manual mode and a consistent white ("daylight") balance of 5350K (unless otherwise noted), was used to capture images of the test locations. Also useful for comparative purposes.

Note: Photographs cannot fully represent one's visual experience. The dynamic range and adaptive sensitivity of our visual system at night cannot be matched without photographic manipulation. These photos are intended to capture and compare the light sources objectively. They do not capture the actual visual experience at the locations. For this reason, they may appear darker or more with more contrast than one would experience in person.

Remotely Sensed Data

Previous to the assessment, a number of sources and tools to understand the nighttime environment in the area were used. These include:

VIIRS - Beginning operation in 2012 the Visible Infrared Radiometric Suite (VIIRS) instrument collects nightly images of the Earth at night. VIIRS data is panchromatic (does not distinguish color), is not sensitive to blue light and has a resolution of only 750m/px.

SDGSat-1 - The Sustainable Development Goal Satellite (SDGSat-1) is operated by the China National Space Administration. It provides occasional nighttime imagery of selected areas across the Earth with high resolution (10m/px) panchromatic and color (RGB, 40m/px) data.

Radiance Light Trends - Radiance light trends is a web interface (https://lighttrends.lightpollutionmap.info) that generates the monthly trend in light emissions based on VIIRS data for any location or area on Earth.

Pre Field Survey

There are two overarching ways lighting can affect the nighttime environment - skyglow and direct glare. Skyglow is a general brightening of the night sky due to the scattering of light in the atmosphere. It can be generated by light emitted upwards, unshielded horizontal light and light reflected off of illuminated surfaces into the sky. Glare is uncontrolled light that directly impacts the eye, flora, fauna or an environment.

Regional Light Pollution Context

On a regional scale, the light emissions of the Village of Oak park is similar to other cities of comparable size (Figure 1). The light of Chicago - one of the brightest cities in the US - dominates the light emissions of the area. In comparison, Oak Park emits much less light than its neighbor. A comparative sample using the same size area of neighboring Austin to the immediate east shows that Oak Park emits 2.7x less light.

High resolution nighttime satellite data help reveal areas and specific locations where there are particularly high sources of upward light emission from the Village (Figure 2). These data also help to identify sites to be observed in person. Upward light emission is an acute issue for ecological and environmental well-being. It directly contributes to sky glow, it is a threat to migratory birds and it is, by definition, wasted light.

One interesting observation seen in Figure 2 is that in contrast to Austin (right), the streets of Oak Park are not apparent. This could be attributed to a number of factors. Oak Park on average has more tree cover than Austin. This could be blocking some of the upward light. The street light levels in Oak Park are lower than in the Austin neighborhood. Finally, the King Arthur style lights that are dominantly used on residential streets do not illuminate surfaces immediately below them which reduces high upward reflectance - yet this also means much of their light is directed horizontally which creates glare and light trespass.

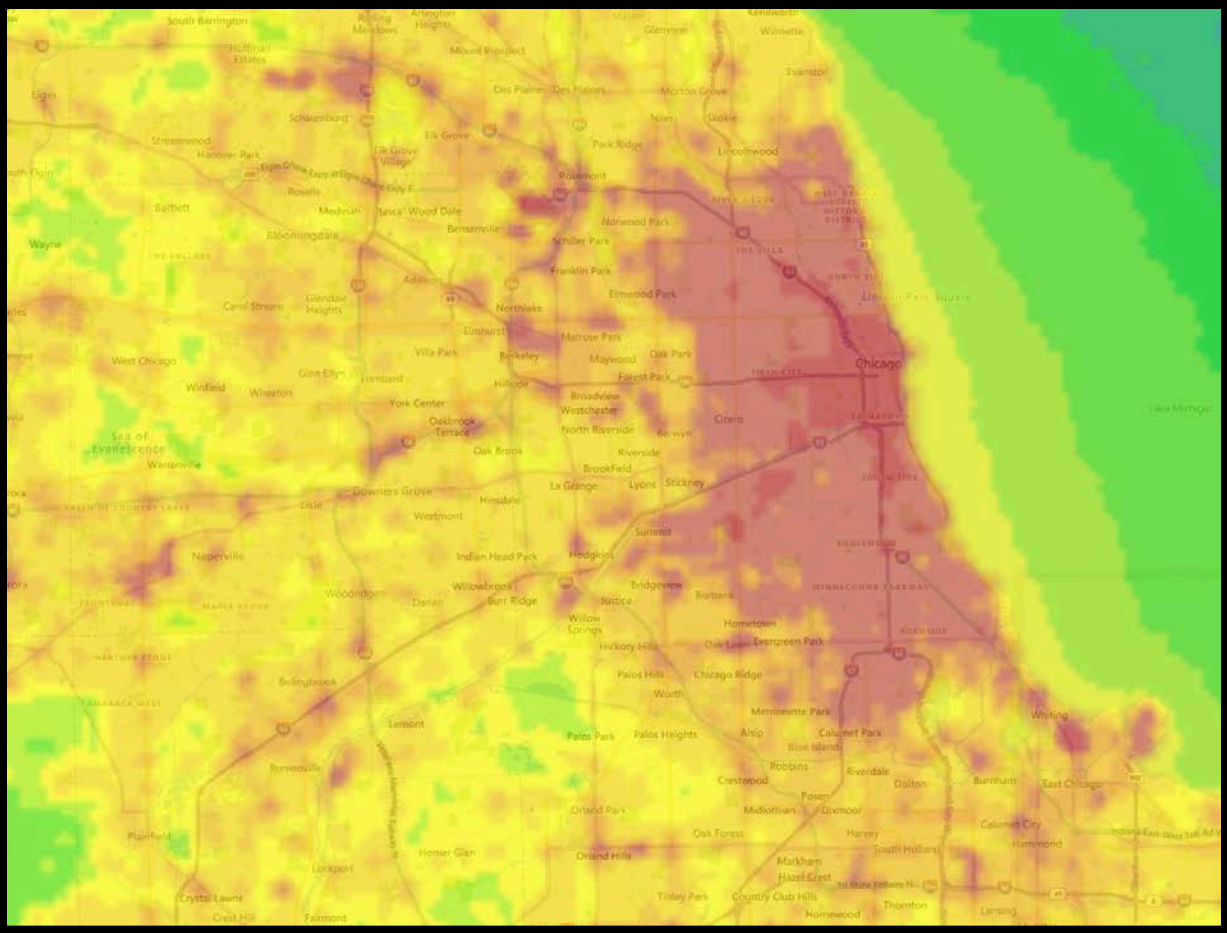

Figure 1: Regional Light Emission Environment *showing the context of Oak Park and the surrounding area. Oak Park stands out in contrast to the city of Chicago to the east.*

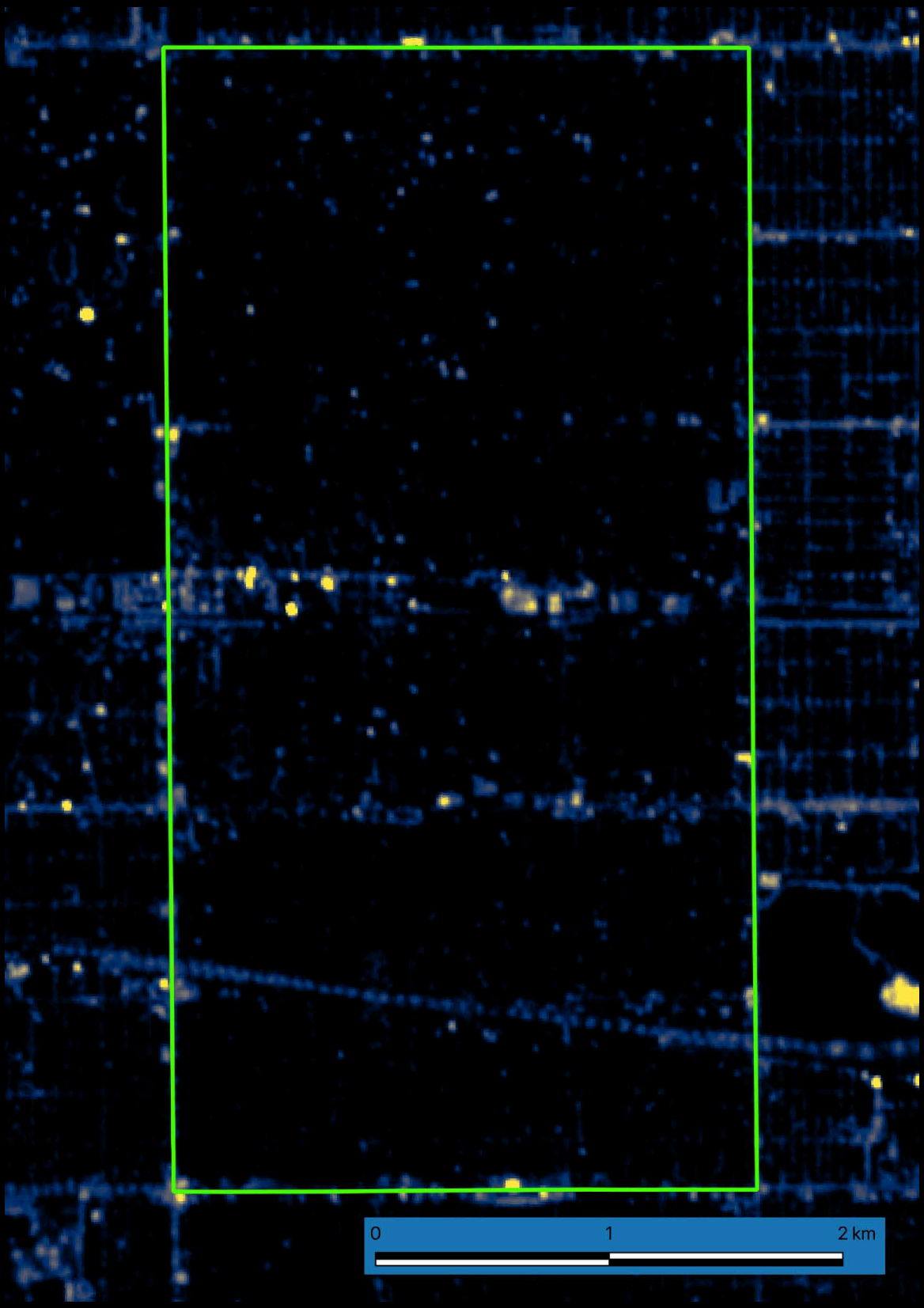

Figure 2: Light emission map of Oak Park. *Bright sources tend to be clustered in commercial areas. This image was taken on the night of Saturday February 11, 2023 at 9pm local time..*

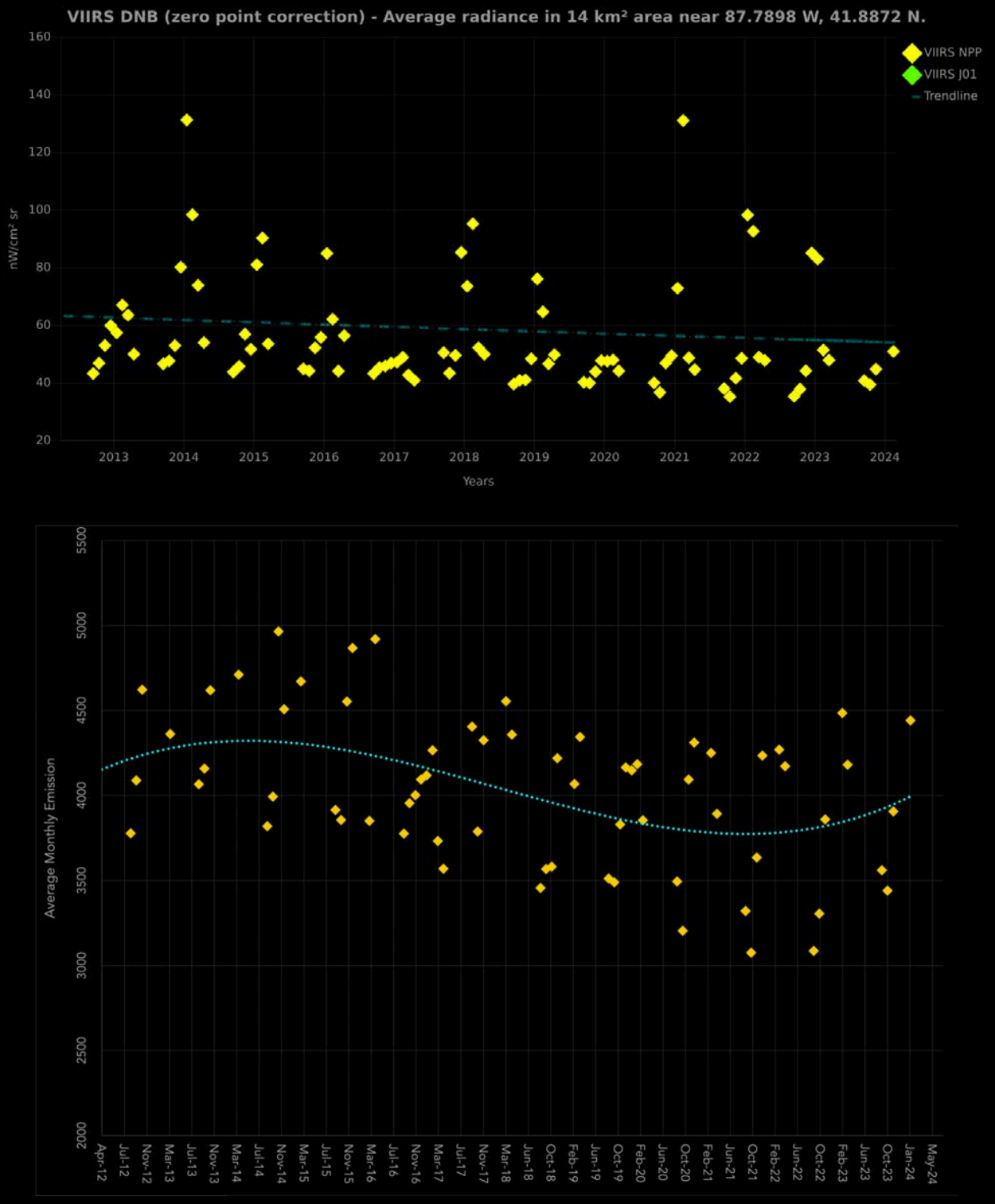

Figure 3: Monthly radiance of Oak Park (2012-2024) *The top figure shows the monthly trend of light emissions since 2012. There is an average 1.3% annual decrease in total light emission. The bottom figure removes months with snow cover.*

Nightly observations available from NOAA/NASA provide monthly averages of light emissions since 2012. This can help reveal trends in the light environment of Oak Park. Figure 3 (top) shows that the light of the Village has been relatively stable with a small (1.3%) annual average decrease. Removing bright outlying winter months (when snow cover increases light reflected from the ground), reveals a potentially clearer picture (Figure 3 bottom). It appears since

mid-2014 light emissions were decreasing but this trend stopped in mid-2020 - and is possibly showing a slight upward trend. An important caveat is that the VIIRS instrument does not detect blue light, meaning if there has been a significant retrofit of lighting to higher color temperature LEDs (ex.3000K) since 2012, this increase can be a significant underestimation.

To place Oak Park in context of all the communities neighboring Oak Park (including Austin as a separate entity) satellite data were sampled to see how the Village compares (Figure 4).

	Max	Mean	StdDev
River Forest	2903	8.46	40.14
Oak Park	2767	10.82	37.66
Berwyn	1476	13.11	32.14
Elmwood Park	3559	13.49	61.45
Forest Park	1108	16.77	39.10
Cicero	4095	26.44	62.64
Austin	1310	26.83	42.46
Chicago	3202	28.79	73.07

Figure 4: Comparison statistics of total light emissions from Oak Park to its surrounding communities sorted by mean value of brightness.

A few informative take-aways:

- Oak Park has peak sources that are brighter than any sources in Berwyn, Forest Park or Austin. (see Max)
- Of all surrounding communities only River Forest, on average, emits less light than Oak Park
- Oak Park averages nearly 3x less light emission that Chicago and about 2.5x that of Cicero

We do not have conclusive information on why Oak Park varies from its neighboring communities as the lighting in those communities has not been assessed. It is most likely a complex combination of many factors. For example, if we look at the data of tree canopy density (Figure 5) we can see that a more dense tree canopy may be part of the explanation of why Oak Park emits substantially less upward light than Austin and Cicero and why River Forest emits less. Yet, in comparison, Berwyn and Elmwood Park are on par with the tree canopy density of Austin yet emit much less light. If Oak Park had an equivalent amount of tree canopy as Berwyn and Elmwood Park would it still emit less light? We do not know for certain.

The use of dark sky sensitive lighting, such as the recently retrofitted alley lighting, may also be contributing to the improved nighttime light emission as compared to surrounding communities.

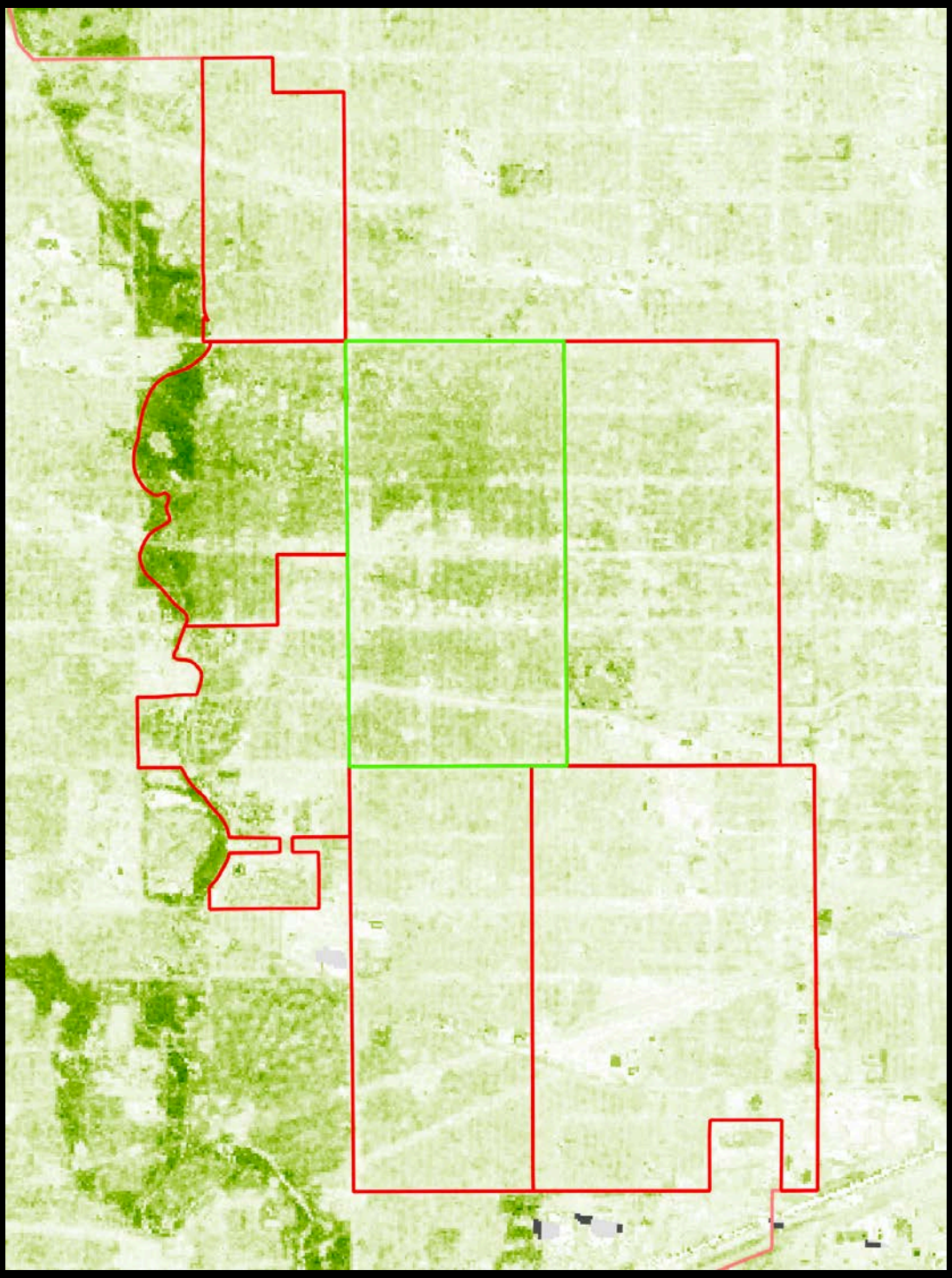

Figure 5: Tree canopy density of Oak Park versus adjacent communities (Clockwise from East: Austin, Cicero, Berwyn, Forest Park, River Forest, Elmwood Park, Chicago)

Field Work Site Selections

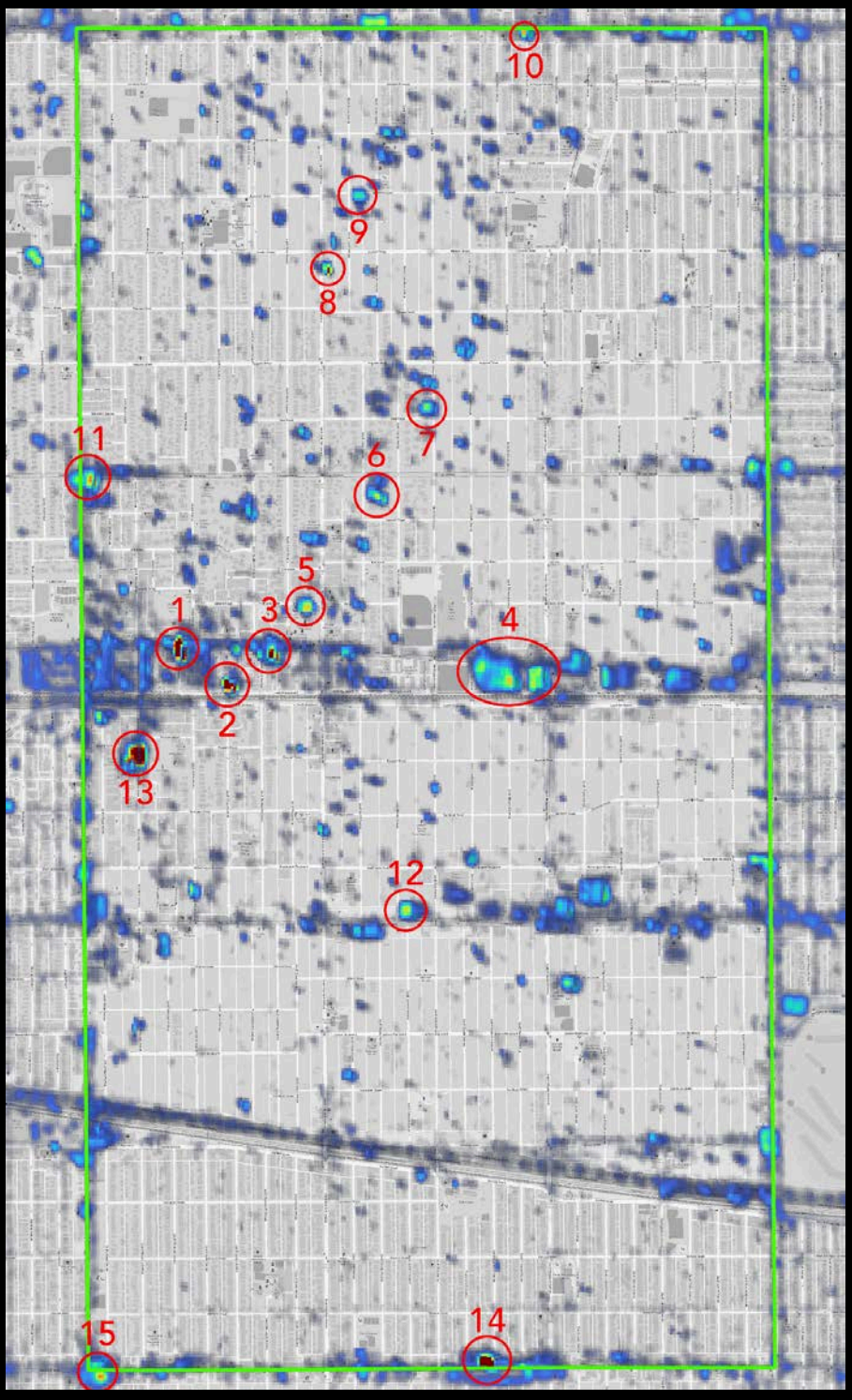

Figure 6: Bright sources of upward emission *These satellite observations were taken on the nights of Saturday February 11, 2023 and Saturday February 3, 2024 both at 21:00 local time providing the sources of the areas of brightest emission. These observations were used to identify locations of interest for field surveying.*

Using remotely sensed data (Figure 6), 15 locations of interest were selected for field observations. These sites, marked in Figure 6, are identified and listed in Table 1. All these sources were visited during my assessment. See Site Photos for images and notes of a selection of these locations.

Table 1: Light Emission Sources

1	Financial Institution
2	Apartments
3	Religious Institution
4	Ridgeland Fields
5	Scoville Park tennis courts
6	Private Home
7	Private Home
8	Private Home
9	Private Home
10	? (Unidentified)
11	Gas Station
12	Gas Station
13	Hotel
14	Manufacturer
15	Gas Station

The streetlight inventory was used to identify the location of the various lighting styles and technologies used in Oak Park. The 6563 inventoried street lights are of 10 different styles and use 5 different lighting technologies in significant numbers (Table 2). Each was identified and investigated as best as was possible to assess their efficacy and dark sky compliance. Table 2, identifies those that are acceptable for nighttime conservation and preservation in green. Those that are not compliant are in red.

Table 2: VOP Streetlight Styles and Technologies

Styles		Technologies	
King Arthur	2427	LED	4191
Cobra Head Round	1520	Mercury Vapor	1637
Alley Cobra Flat	998	High Pressure Sodium	284
Cobra Flat	735	Unknown	174
King Arthur (enclosed)	212	Metal Halide	151
Antique	210	Induction	119
Globe	182	Low Pressure Sodium	3
Acorn	151	Incandescent	2
Cobra Head	100		
Square Head	16		

Field Survey

General Lighting Environment

In general, for municipally controlled street lighting, the illuminance levels on arterial and collector roads, where measured, were at acceptable levels according to IES standards (RP-8-21). Local (residential) streets - particularly those where King Arthur fixtures are used - met IES standards for illuminance but suffer from high levels of vertical luminance that create disability glare and light trespass. Excessive vertical luminance is not only a safety hazard but is a significant contributor to negative ecological impacts. Disability glare constricts the pupils of pedestrians and drivers. This may, in turn, reduce visual acuity which can create hazardous situations. Light trespass on residential property can disrupt sleep and circadian rhythms. For these, and additional reasons, vertical luminance should be minimized.

Site Photos

Municipal Street Lighting

Figure 7: Examples of lights obstructed by trees *rendering them virtually ineffective and an ecological hazard.*

Figure 8: *A few of the numerous examples of municipal street lights observed "on" during daylight hours.*

Figure 9: Examples of undesirable light trespass from street lights in residential areas. *(Top Left) High level light spill on a residence on Fillmore from a "full-cutoff" LED street light. (Top Right) House windows illuminated by King Arthur street light. (Bottom) Excessive light trespass on residential windows from a King Arthur fixture on Wesley.*

Figure 10: Glare from high intensity and unshielded lights at Ridgeland Commons field *(left). View of the field lights as seen from the home on N Elwood (right).*

Figure 11: Light trespass on homes from Ridgeland Commons lights*. At the 100 block of N Elmwood (left), 500 ft from the field, light levels at the front porch were 2.4 lux. At the windows of the apartments on Lake and Elmwood (right) light levels were 12.1 lux. Recommended light trespass is 0 lux.*

Figure 12: Gas station on Roosevelt. *The use of high lumen, 5500K, LED flat panel lights inappropriately tilted above 90 deg generates dangerous amounts of glare and trespass. The excessive glare - at a busy intersection - can create visibility issues for drivers.*

Figure 13: Significant light trespass from the BP station *can be seen on the home across the street (left). Light levels under the canopy at a gas station on Madison (right) peaked at 790 lux. The IES recommended standard is 135 lux. Positively, the station does not use lights exterior to their canopy.*

Commercial Lighting

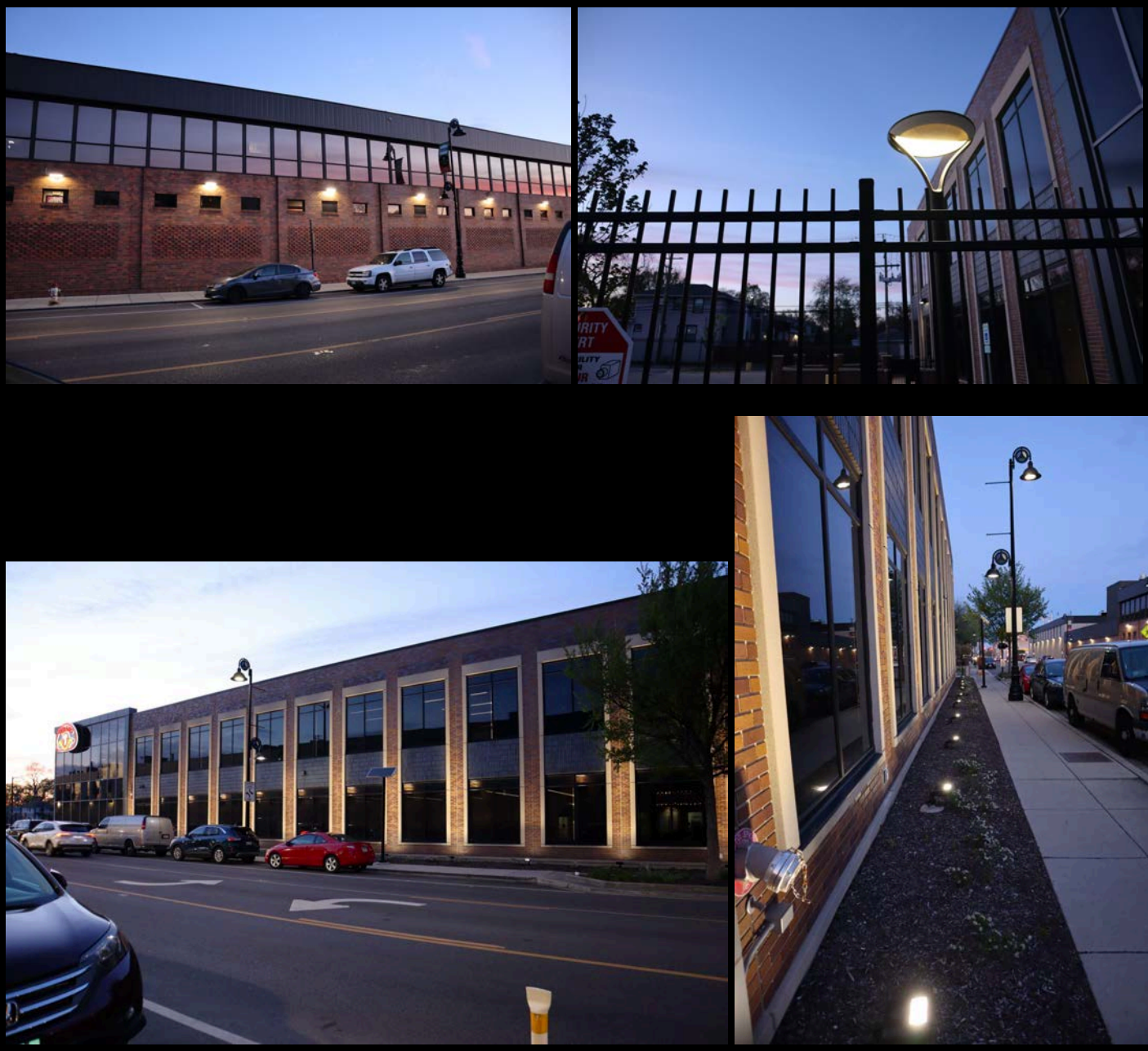

Figure 14: Lighting at this manufacturer *is both ecologically and dark sky responsible (top) and not (bottom). Up lighting on building façades is a common misuse of lighting that greatly contributes to sky glow and can affect the safety and survival of migrating birds as an example.*

Figure 15: Additional examples of uncontrolled uplighting *at a bank building (top left), 700 block of Lake St. (top right), apartments (middle) and 900 block of North Blvd. Since the lights seen in the middle photos are at ground level, they create direct glare to motorists (middle left) and cause high levels of light trespass into trees and residential windows.*

***Figure 16: An unoccupied commercial building on Madison**. The multiple, unshielded, high-intensity LED wall-packs and parking lot lights are on during the day and are exceedingly bright at night with no clear purpose.*

Residential Lighting

***Figure 17: Examples of residential landscape lighting** that are both high-intensity and upward pointing. Uplit trees are a particular ecological concern as they strain the health of trees and can disrupt the natural habitat, foraging and resting places for many species.*

Figure 18: Examples of well applied lighting. *A good example of the use of private lighting used to illuminate the garage and alley (left). The light is at an appropriate level, shielded and a warm color temperature. [Note: the addition of motion sensors could improve the effectiveness and efficiency of this lighting]. Good example of commercial lighting (right). The under canopy lighting eliminates all uplight. The recessed can lights eliminate nearly all glare. The establishment remains well lit.*

Lighting Inventory Results

VOP Lighting Inventory

Although a full lighting inventory is beyond the scope of this assessment, I performed an ad hoc one to help gauge the lighting environment of the Village. Figures 19 and 20 map the location of varying lighting technologies. Figure 19 shows those technologies that meet the criteria for Dark Sky compliance based on their color temperature alone. Figure 20 are those lighting technologies (ex., Mercury Vapor, Metal Halide) which do not meet Dark Sky color temperature recommendations.

Figures 21 and 22 do the same for the design of different lights used in the Village. The criteria for compliant versus non compliant lighting is based on the quantity of uplight the designs generate - or the shielding they provide.

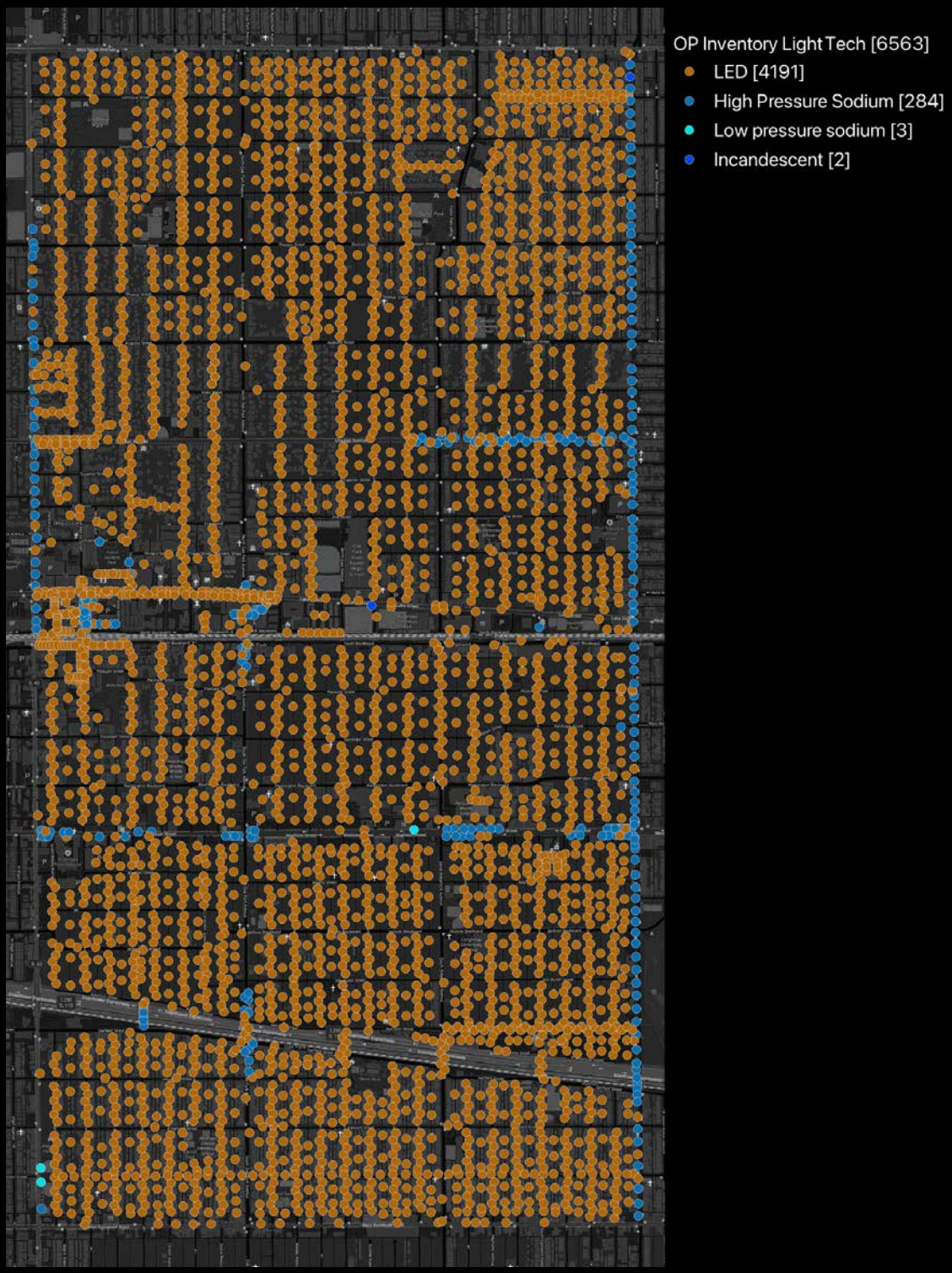

Figure 19: Locations of VOP Light Technology Inventory *with recommended color temperature (≤3000K)*

Figure 20: Location of VOP Light Technology Inventory *exceeding recommended color temperature (>3000K)*

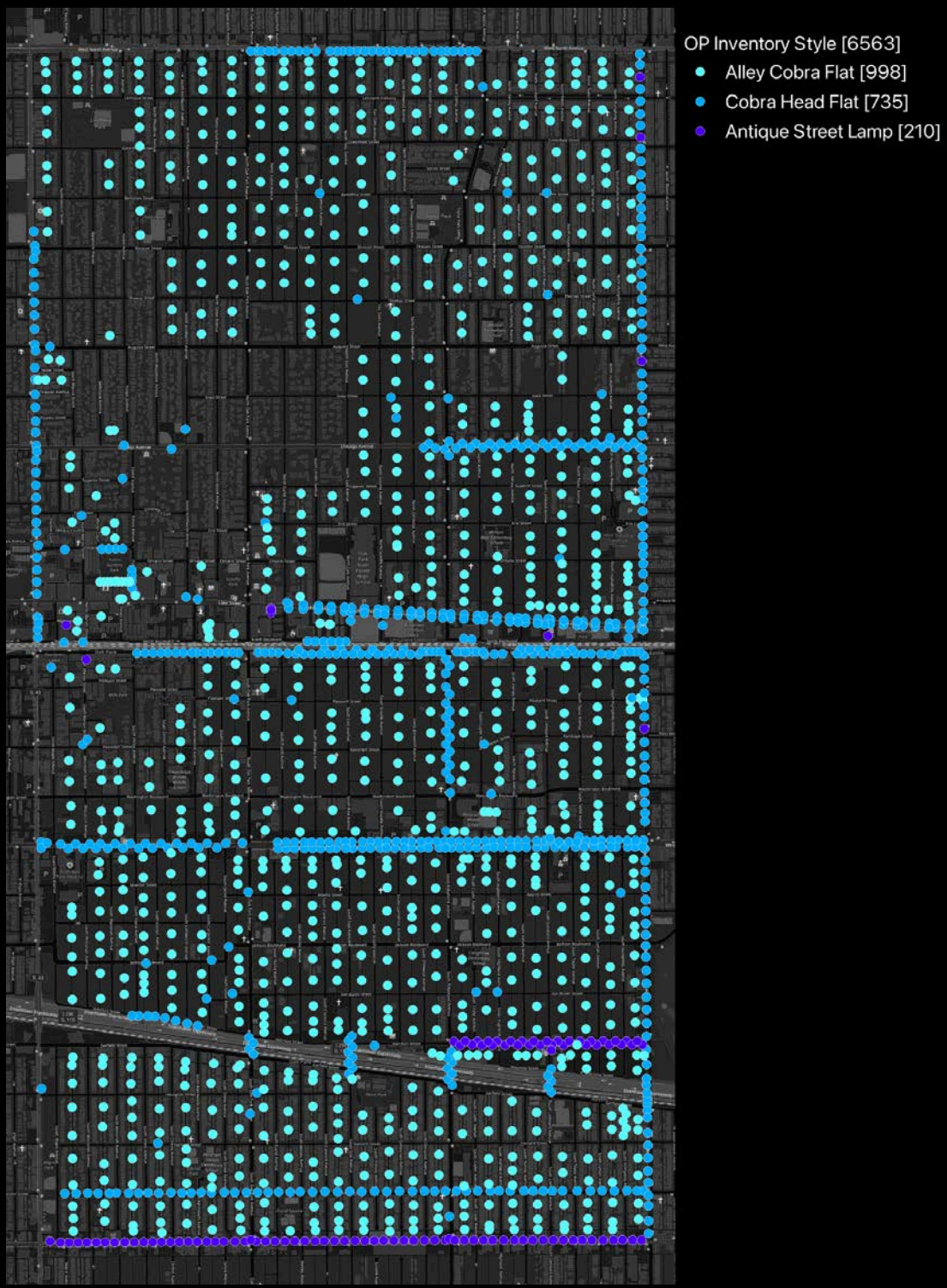

Figure 21: Location of VOP Lighting Style Inventory *conforming to recommended light distribution (with a limited amount of up light).*

Figure 22: Location of VOP Lighting Style Inventory *not conforming to recommended up light or shielding.*

Light Emission by Land Use

Village of Oak Park zoning information was used to better understand the sources of light emission and their contribution to the illumination of the nighttime environment.

Figure 23: Oak Park Land Use by Zoning Description and Category *with remotely sensed radiance data*

Figure 24 ranks all the defined zoning areas by their average (mean) quantity of emission. These zones are also grouped by land use category (below) and are sorted by their mean total emission.

Residential lands, as a whole, have the lowest light levels. Commercial properties almost exclusively are the brightest property class. Roads are worth noting. They account for a large percentage of the land in the Village (second only to residential property) so although their average emissions are below the median (26.2), they contribute the second greatest amount of total emissions of any category. Similarly, residential properties contribute the largest amount of emissions of all zoning categories primarily due to the large amount of land they cover. Commercial properties, by far, contribute the most upward light as a ratio of their emission by area.

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ZONE	ZONING DESCRIPTION	ZONING CATEGORY	Area	Count	Sum	Mean	% of Tot
R-3-35	Single-Family Residential District	Residential Districts	4695691	4334	23904	5.5	1.3%
R-4	Single-Family Residential District	Residential Districts	16335883	15147	85542	5.6	4.6%
R-3-50	Single-Family Residential District	Residential Districts	13136117	12195	71314	5.8	3.9%
R-5	Two-Family Residential District	Residential Districts	4481761	4170	31650	7.6	1.7%
R-2	Single-Family Residential District	Residential Districts	19925062	18444	156557	8.5	8.5%
R-6	Multi-Family Residential District	Residential Districts	18114	15	184	12.3	0.0%
R-6	Multi-Family Residential District	Residential Districts	494025	460	6961	15.1	0.4%
R-1	Single-Family Residential District	Residential District	4334773	4032	62753	15.6	3.4%
	Roads	Roads	38833166	36150	596011	16.5	32.3%
I	Institutional Zoning District	Special Purpose Districts	3171915	2908	51614	17.7	2.8%
R-7	Multi-Family Residential District	Residential Districts	9241326	8626	168517	19.5	9.1%
OS	Open Space Zoning District	Special Purpose Districts	3890456	3594	93993	26.2	5.1%
P-R	Rail and Highways	Right-of-Way	3044131	2822	74867	26.5	4.1%
DT-2	Hemingway Sub-District	Commercial Districts	568944	510	14993	29.4	0.8%
HS	Harrison Street Zoning District	Commercial Districts	376427	348	10416	29.9	0.6%
NA	North Avenue Zoning District	Commercial Districts	906960	845	26467	31.3	1.4%
H	Hospital Zoning District	Special Purpose Districts	928345	877	28939	33.0	1.6%
NC	Neighborhood Commercial Zoning District	Commercial Districts	2213924	2051	73070	35.6	4.0%
MS	Madison Street Zoning District	Commercial Districts	1606911	1490	63719	42.8	3.4%
GC	General Commercial District	General Commercial	318948	306	14318	46.8	0.8%
RR	Roosevelt Road Form-Based District	Commercial Districts	876626	803	57395	71.5	3.1%
DT-1	Downtown Central Sub-District	Commercial Districts	1214408	1140	88059	77.2	4.8%
DT-3	Pleasant Sub-District	Commercial Districts	408522	388	46531	119.9	2.5%
		TOTALS:	**131022435**	**121655**	**1847774**	**26.2**	**100.0%**
		Commercial	8491668	7881	394968	50.1	21.4%
		Hospitals	928345	877	28939	33.0	1.6%
		Rail and Highways	3044131	2822	74867	26.5	4.1%
		Open Space	3890456	3594	93993	26.2	5.1%
		Institutional	3171915	2908	51614	17.7	2.8%
		Roads*	38833166	36150	596011	16.5	32.3%
		Residential	72662753	67423	607382	9.0	32.9%

Figure 24: Light Emission by Zoning Description *sorted by mean emission. Color coding by category as above. Summary by zoning category at bottom.*

Figure 25 ranks each property type by the percentage of the total upward light emitted in the Village. Both this and the previous example are helpful ways of visualizing the amount of observed nighttime light. This can help in guiding effective policy for the mitigation and prevention of light pollution. As we can see, addressing the quality and levels of road lighting could result in effectively targeted benefits. Although, the R-7 and R-2 zones together do contribute more than half of all the light of roads (17.6%).

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R-2	Single-Family Residential District	Residential Districts	19925062	18444	156557	8.5	8.5%
R-7	Multi-Family Residential District	Residential Districts	9241326	8626	168517	19.5	9.1%
	Roads	Roads	38833166	36150	596011	16.5	32.3%
		TOTALS:	**131022435**	**121655**	**1847774**	**26.2**	**100.0%**

Figure 25: Light Emission by Land Use Type *sorted by total emission.*

Light Spectra

A number of lights controlled by the Village and some examples of private commercial lighting were sampled with a spectral radiometer. The spectrum of lights can provide valuable information regarding the health and ecological impacts of that light as well as their efficacy. The blue content of light contributes disproportionately to the most detrimental outcomes of ALAN. The AMA has warned that high frequency, blue light is most disruptive to sleep health and our circadian rhythms. Blue light contributes more so than warmer light to sky glow and disability glare - particularly in older people. Although there is no one color of light that does not affect ecological systems, blue light in general has the greatest negative impacts. Figure 24 shows an example of a 2700K LED source - recommended by DarkSky, the AMA and ecologists. The blue content is only 11.3% of the total light output. In contrast, we can compare the blue output of lights in the Village inventory (Figure 27).

The S/P ratio helps indicate the visual efficiency of that light. The higher the ratio, the lower the amount of lumens required to meet the same visual response of a light with a lower S/P ratio.

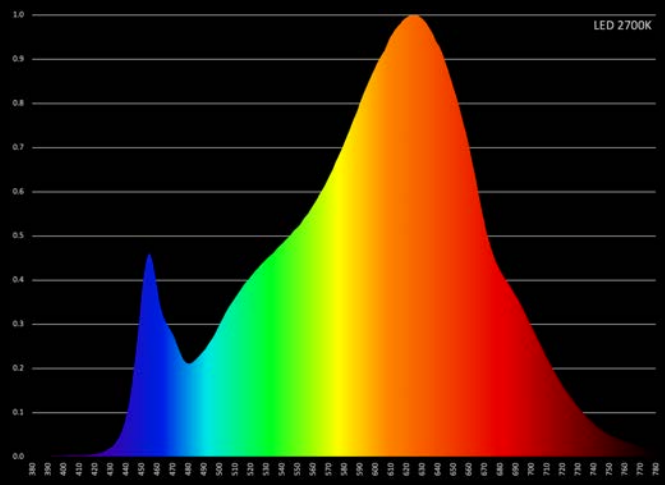
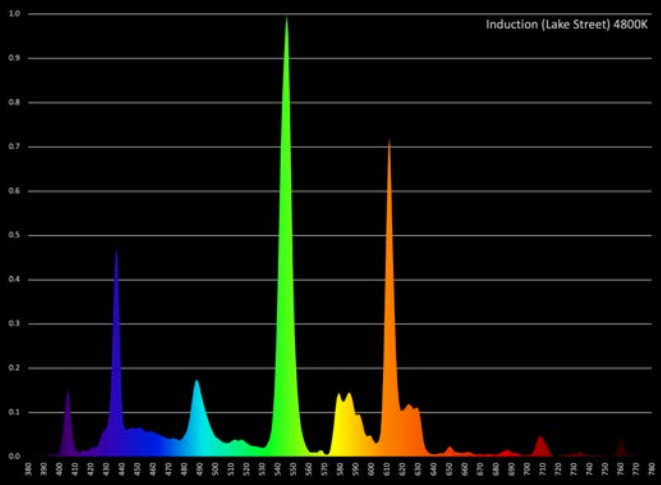
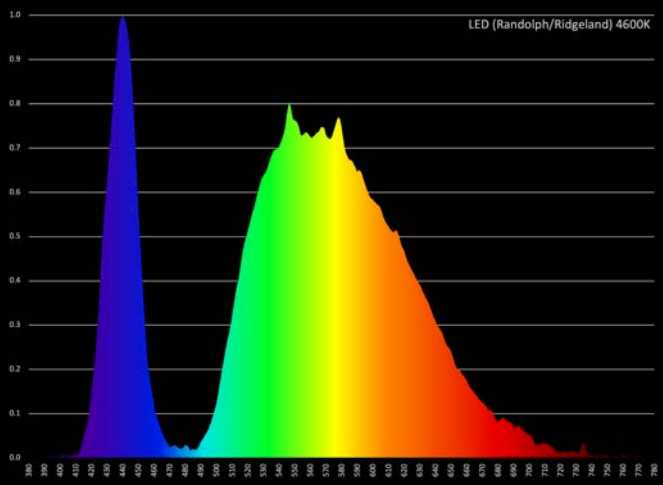


Figure 26: Example 2700K LED *11.3% blue content. S/P ratio: 1.33*

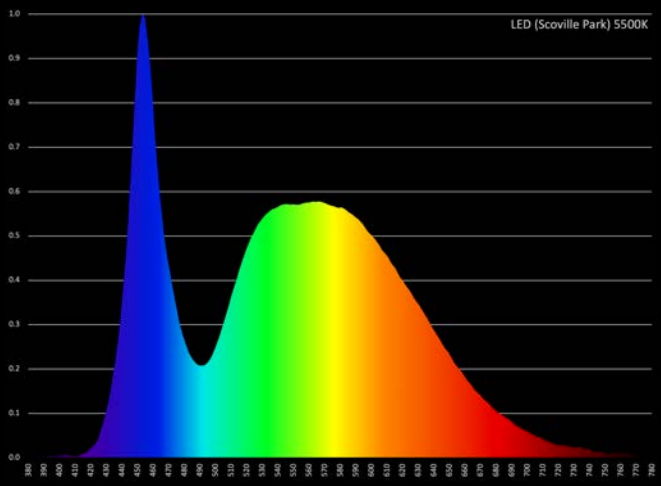
Municipal Controlled:



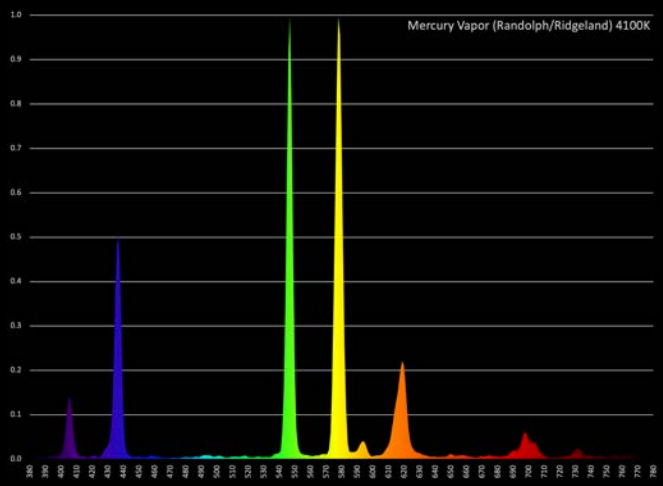
Lake St. Induction Street Light
4800K, 28.2% blue, S/P ratio: 1.67



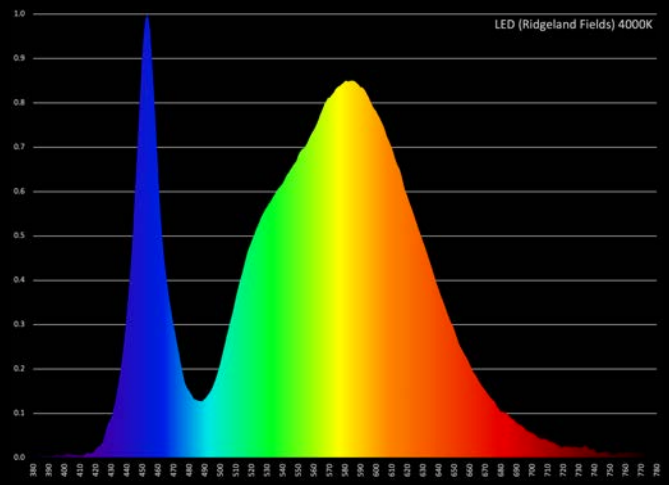
Randolph/Ridgeland LED Street Light
4600K, 22.6% blue, S/P ratio: 1.49



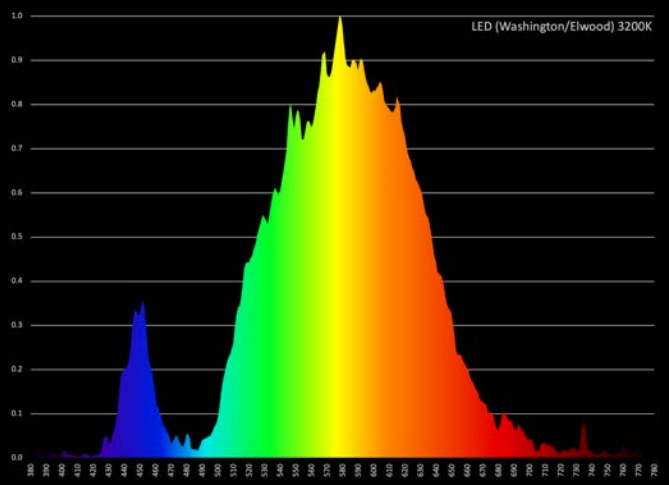
Scoville Park LED
5500K, 29% blue, S/P ratio: 2.00



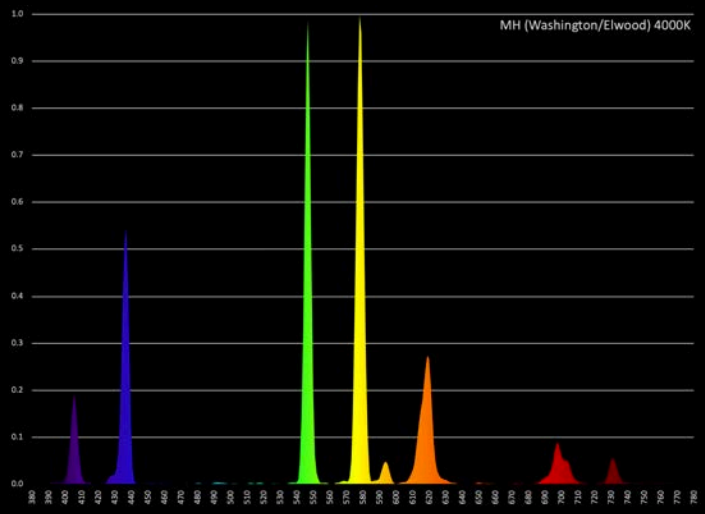
Randolph/Ridgeland MV Streetlight
4100K, 21.4% blue, S/P ratio: 1.02



Ridgeland Park Field LED
4000K, 21.1% blue, S/P ratio: 1.55



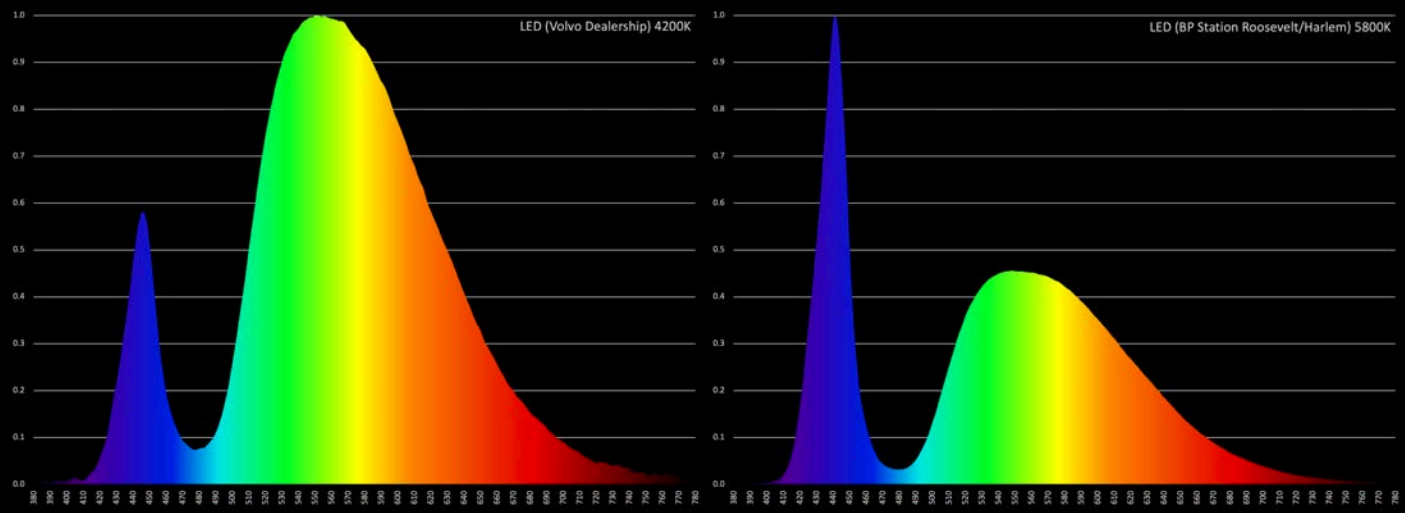
Washington/Elwood LED
3200K, 7.8% blue, S/P ratio: 1.10



Washington/Elwood Metal Halide
4000K, 22.1% blue, S/P ratio: 0.97

Figure 27: Spectra of Municipal Lighting

Commercial Examples:



Car Dealership LED
4200K, 13.5% blue, S/P ratio: 1.43

Gas Station LED
5500K, 30.7% blue, S/P ratio: 1.77

Figure 28: Examples of Commercial Lighting Spectra

Recommendations

Recommendation 1:

Address outdated and/or inefficient municipal lighting based on the IES/DarkSky recommended 5 Principles of Responsible Outdoor Lighting.

In 2020, the Illuminating Engineering Society in partnership with DarkSky International released the *5 Principles of Responsible Outdoor Lighting* as guidance for the safe, efficient, effective and environmentally sound use of light at night. In short, these Principles say that all lighting should be:

1. **Useful** - Have a clear purpose
2. **Targeted** - Directed only to where it's needed
3. **Low Level** - No brighter than necessary
4. **Controlled** - Used only when it is useful
5. **Warm-colored** - Limited in blue light content

In light of this assessment, I would recommend:

- Municipal Street Lighting:
  - Simplify and streamline inventory with retrofits to efficient, low color temperature and fully shielded LEDs
  - Institute better lighting control systems (e.g. Install astronomical timers or photo sensors. Where appropriate add dimming capability)
  - Increase application of shielding of Alley LEDs
  - Retrofit/Replace King Arthur fixtures or luminaires with Dark Sky approved lighting
- Consider following DarkSky Outdoor Sports Lighting standards

If applied, these Principles and guidelines are not only dark sky friendly, they also improve safety through increased visual acuity, reduce energy consumption (thus reduce climate impact) and help to limit harms to human health and the ecology of the Village.

Recommendation 2:

Improve the quality of life for all residents of Oak Park by creating ordinances and policies that remedy and/or prevent commercial and residential lighting that has demonstrable negative effects on health and wellbeing.

- Limit façade uplighting
- Limit unshielded wall packs
- Limit uplight from tree or landscape lighting
- Limit flat panel LED fixtures tilted above 90°
- Limit lights with a color temperature greater than 2700K

Recommendation 3:

Support the awareness of the harms of light pollution and the benefits of quality lighting for the public and people of Oak Park with education and engagement. Strive to become a model of good lighting practice and positive outcomes for other communities.

Examples of this effort can include:

- Utilize existing Village building incentive programs (e.g. housing rehabilitation, commercial building grants, etc.) to educate about, encourage, or require good lighting practices.
- Work 1:1 with the highest light emission sources to educate and provide recommended solutions to reduce their light emissions.
- Create Village awards for property or business owners that comply with Dark Sky initiatives (similar to some of these)
- Engage with the police department, Crime Prevention through Environmental Design (CPTED), and provide general education about lighting and safety.