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ASSOCIATION

VICTORIA

Why Do We Need a Dark Sky?

Dr. Russ Cockman
Past President, IDA Victoria

What is IDA Victoria (and IDA)?

IDA Victoria's Mission: to preserve and protect the night time environment and our heritage of dark skies through environmentally responsible outdoor lighting

Our Goals:

- Advocate for the protection of the night sky
- Educate the public and policymakers about night sky conservation
- Promote environmentally responsible outdoor lighting
- Empower the public with tools and resources to help “bring back the night”

Why Is The Night So Important?

- The Earth's biosphere is a product of evolution and has evolved according to a day/night cycle
- Lighting up the night interferes with these cycles, with consequences
- Humans are no different
 - our modern 24/7 lifestyle is not how we have evolved to live
- City planners seemingly want to turn night into day
- ALAN (light pollution) has substantially
 - reduced the length of our night and
 - increased the length of our "day"

What is Happening?

- City planners are lighting up the night, to:
 - reduce the “fear of crime” in public spaces
 - provide safe navigation and wayfaring of pedestrians
 - encourage a 24/7 lifestyle
- Lighting designs allow too much light to go *out* and *up* where it was not intended to go, leading to light intrusion - light pollution
- Light pollution has substantially
 - reduced the length of our night and
 - increased the length of our “day”

Light Pollution

credit: NASA



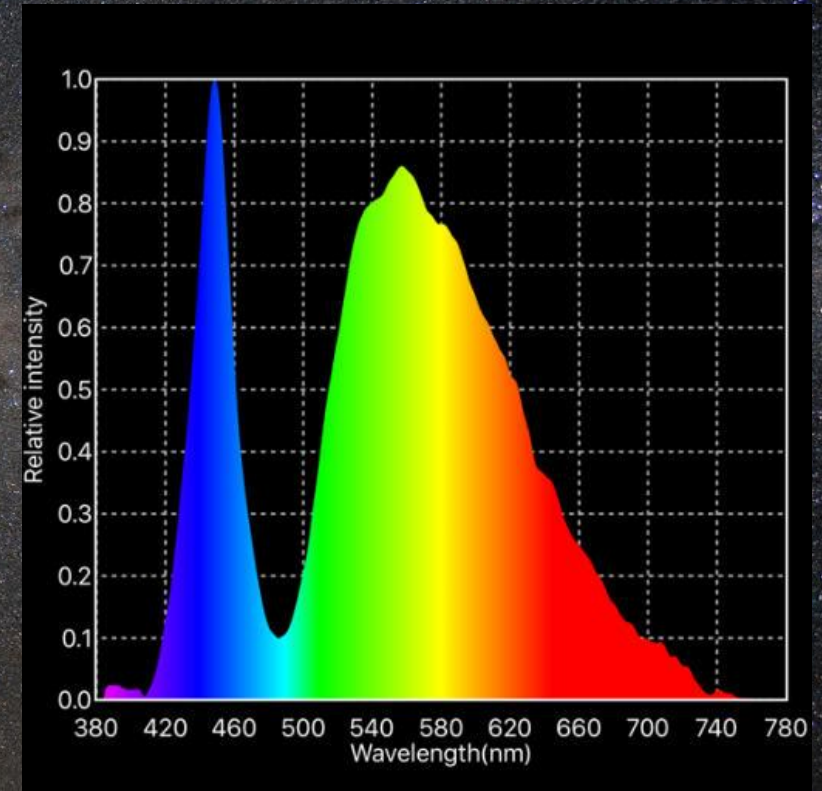
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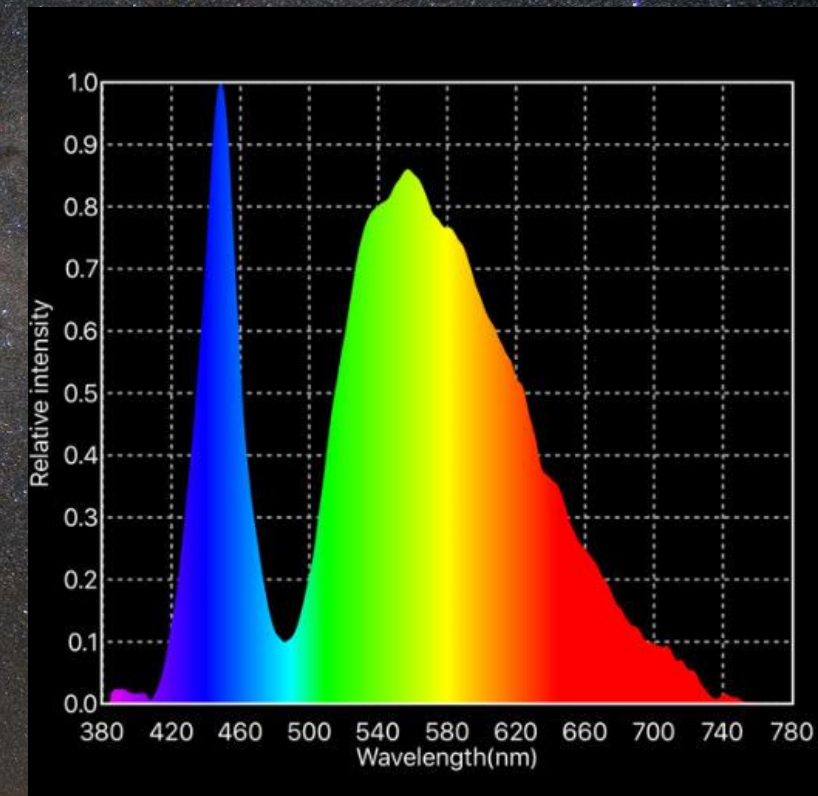
Roll-Out of LED Technology

- Efficient, saves energy and long life, but at a likely substantial cost to the natural environment, including humans
- Standard colour is pure white, CCT = 4000 K



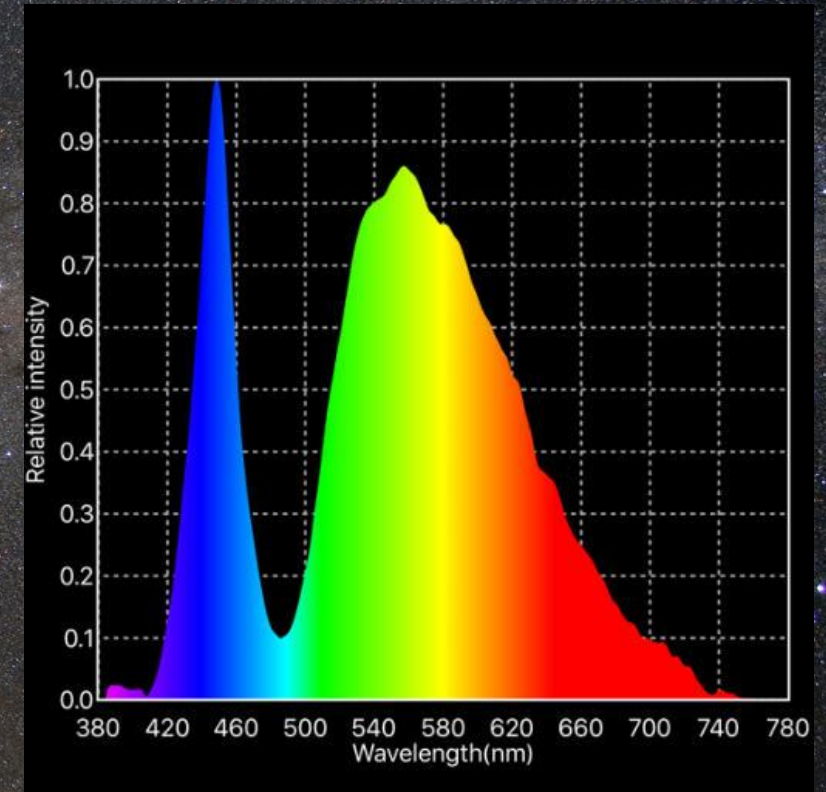
4000 K LED Technology

- Blue content of daylight sets natural circadian rhythms to “day” by suppressing hormonal (**melatonin**) secretion
- At night, natural light (negligible in blue) allows melatonin secretion and a sense of calm, in preparation for sleep



4000 K LED Technology

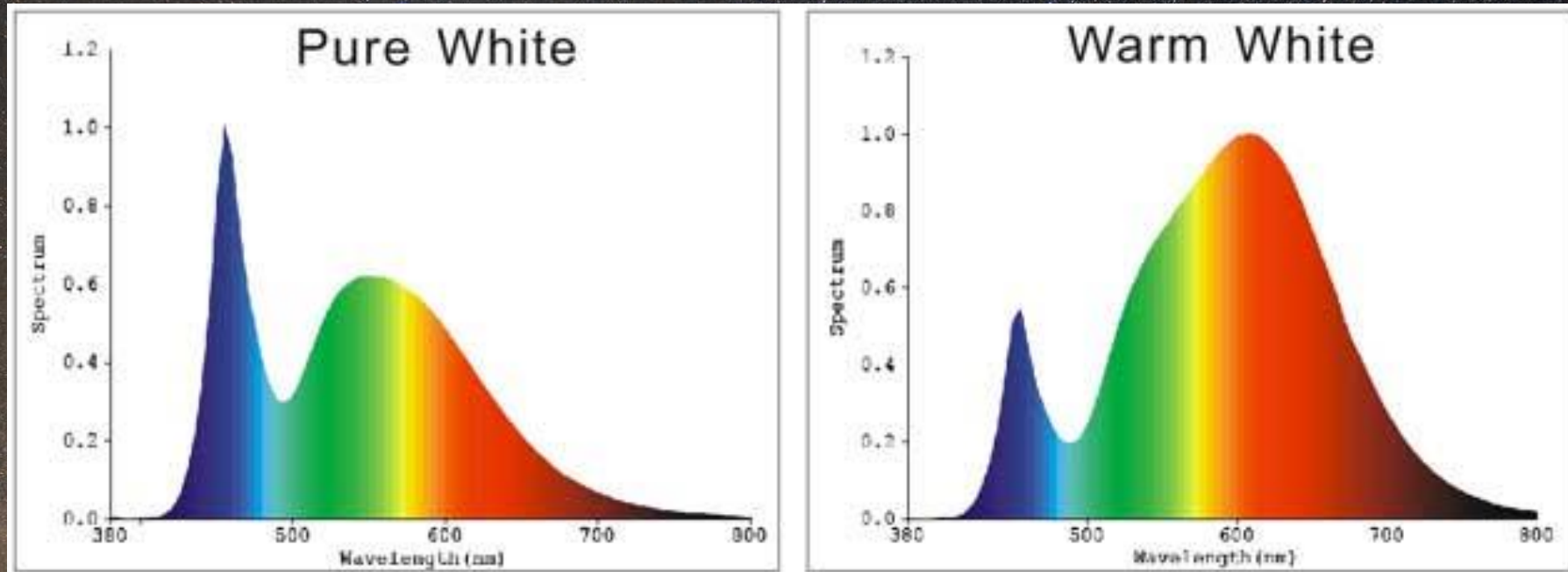
- Artificial, blue-rich, light at night suppresses melatonin secretion resetting body clocks to “day”
 - activates intrinsically photosensitive retinal ganglion cells (ipRGCs) in the eyes
 - a host of impacts of disrupted body clock – disrupted sleep patterns, enhanced rates of certain cancers, psychiatric disorders, depression, obesity, etc, eg, shift workers
- Blue-rich light intruding into the biosphere upsets the natural rhythms
 - much evidence is available – changes in insect behaviour, effects on migrating birds and nocturnal animals, and others



Impact on Biodiversity

- An “Inquiry into Ecosystem Decline” report tabled in the Victorian Parliament on 2 December 2021 highlighted the dramatic decline in biodiversity in Victoria
 - 400 plants, animals and communities are critically endangered
 - 2000 animals, plants and communities are threatened
- Recent British study established a clear link between ALAN from street lighting and reduced moth caterpillar abundance (as a model population)
 - LED impacts were even greater

Roll-Out of LED Technology



- LEDs with lower blue contents, 3000 K, 2700 K, 2200 K are available and will have lower impacts
- These are NOT Standard, but can be supplied on request
 - regulations allow supplier to charge “a fair and reasonable fee” to customer

AMA Adopts Guidance to Reduce Harm from High Intensity Street Lights

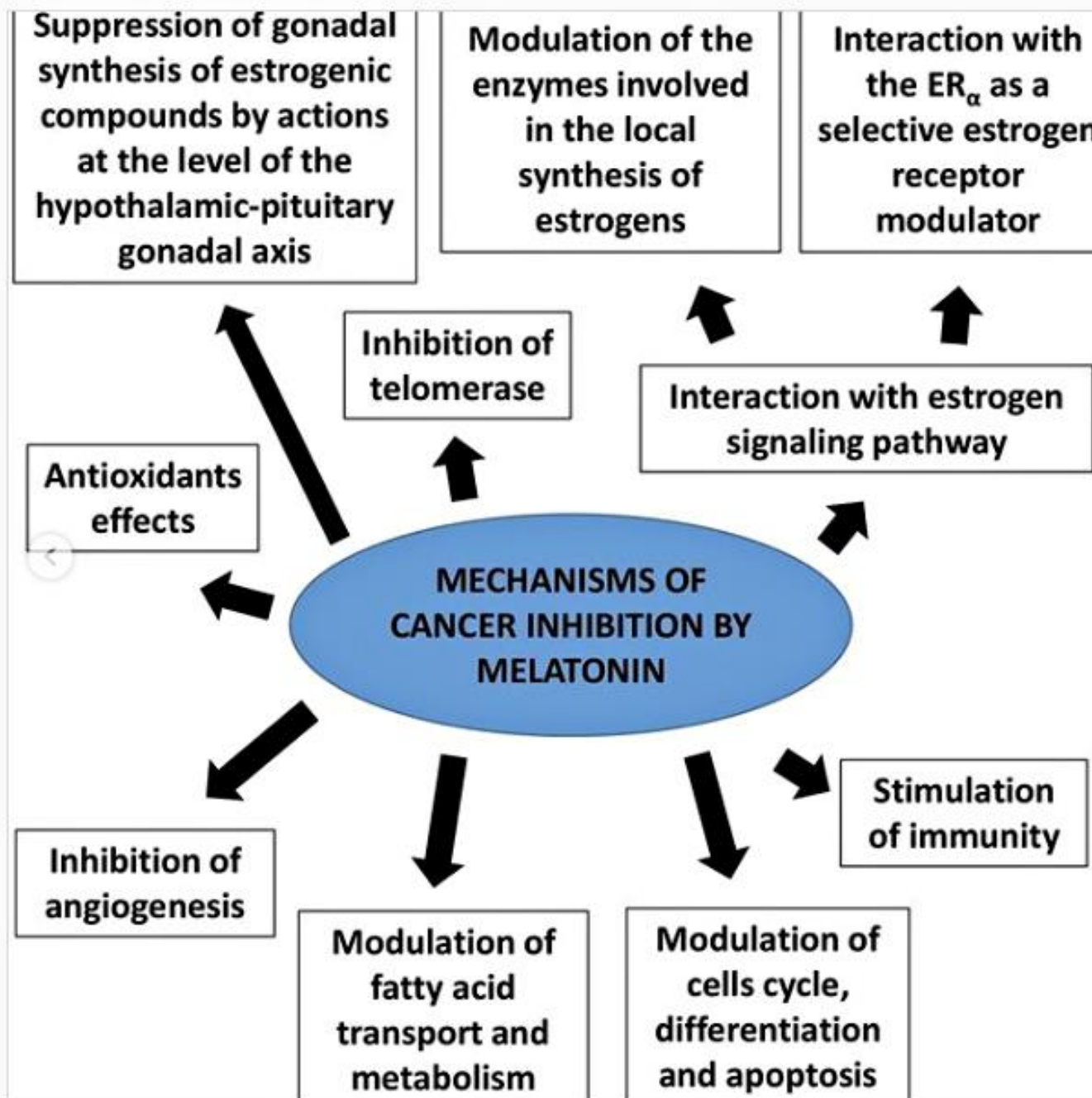
For immediate release: Jun 14, 2016



CHICAGO - Strong arguments exist for overhauling the lighting systems on U.S. roadways with light emitting diodes (LED), but conversions to improper LED technology can have adverse consequences. In response, physicians at the Annual Meeting of the American Medical Association (AMA) today adopted guidance for communities on selecting among LED lighting options to minimize potential harmful human and environmental effects.

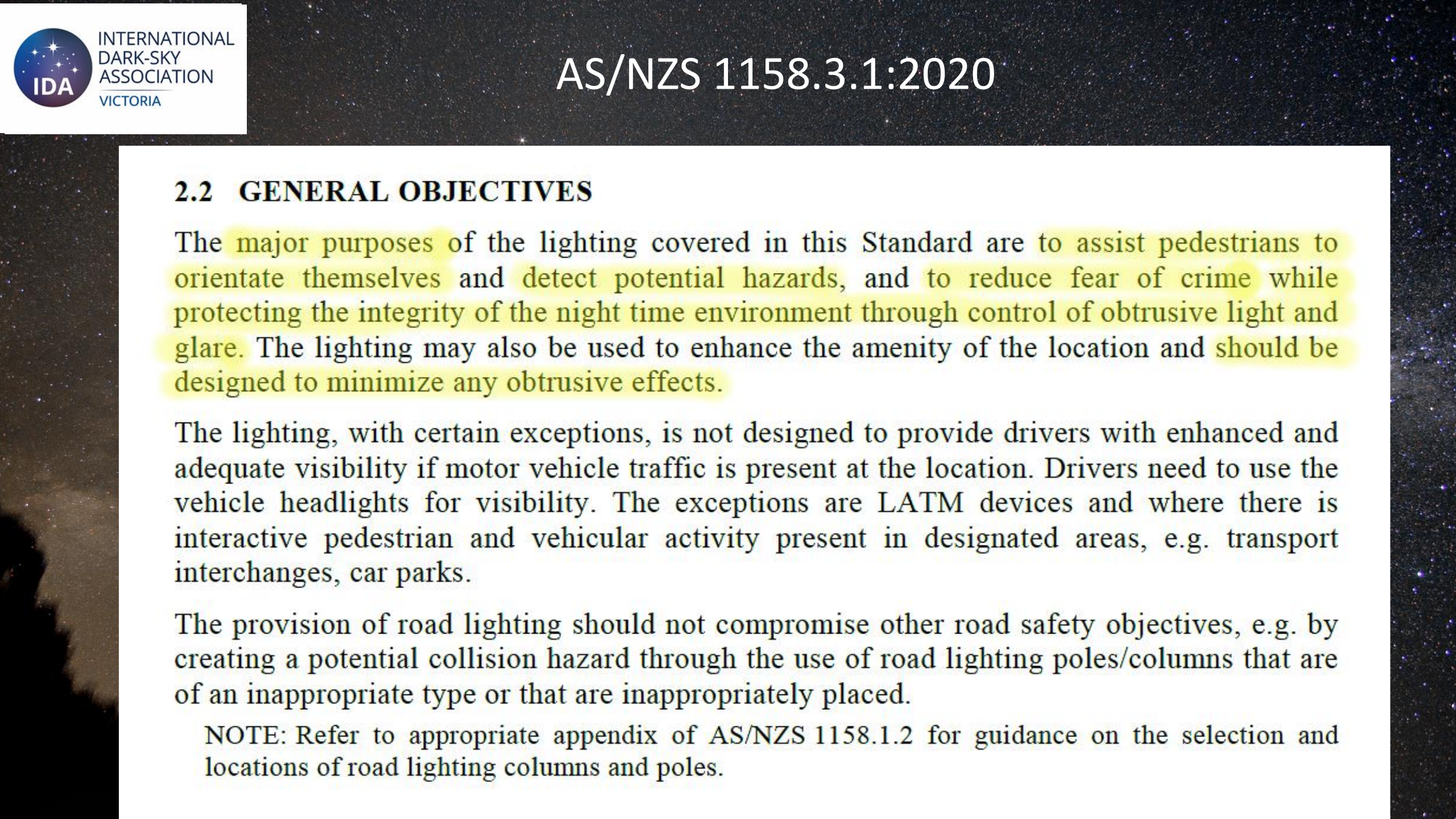
Converting conventional street light to energy efficient LED lighting leads to cost and energy savings, and a lower reliance on fossil-based fuels. Approximately 10 percent of existing U.S. street lighting has been converted to solid state LED technology, with efforts underway to accelerate this conversion.

"Despite the energy efficiency benefits, some LED lights are harmful when used as street lighting," AMA Board Member Maya A. Babu, M.D., M.B.A. "The new AMA guidance encourages proper attention to optimal design and engineering features when converting to LED lighting that minimize detrimental health and environmental effects."



Public Lighting Standards

- AS/NZS 1158.3.1:2020 “Lighting for roads and public spaces; Pedestrian area (Category P) lighting – Performance and Design Requirements”
- AS/NZS 4282:2019 “Control of the obtrusive effects of outdoor lighting” (under review)
- All Standards are voluntary, unless statutes exist to mandate them



2.2 GENERAL OBJECTIVES

The major purposes of the lighting covered in this Standard are to assist pedestrians to orientate themselves and detect potential hazards, and to reduce fear of crime while protecting the integrity of the night time environment through control of obtrusive light and glare. The lighting may also be used to enhance the amenity of the location and should be designed to minimize any obtrusive effects.

The lighting, with certain exceptions, is not designed to provide drivers with enhanced and adequate visibility if motor vehicle traffic is present at the location. Drivers need to use the vehicle headlights for visibility. The exceptions are LATM devices and where there is interactive pedestrian and vehicular activity present in designated areas, e.g. transport interchanges, car parks.

The provision of road lighting should not compromise other road safety objectives, e.g. by creating a potential collision hazard through the use of road lighting poles/columns that are of an inappropriate type or that are inappropriately placed.

NOTE: Refer to appropriate appendix of AS/NZS 1158.1.2 for guidance on the selection and locations of road lighting columns and poles.

Metropolitan Highways – A Comparison

M80 Ring Road



Image credit: Orderinchaos - <https://commons.wikimedia.org/w/index.php?curid=74802209>

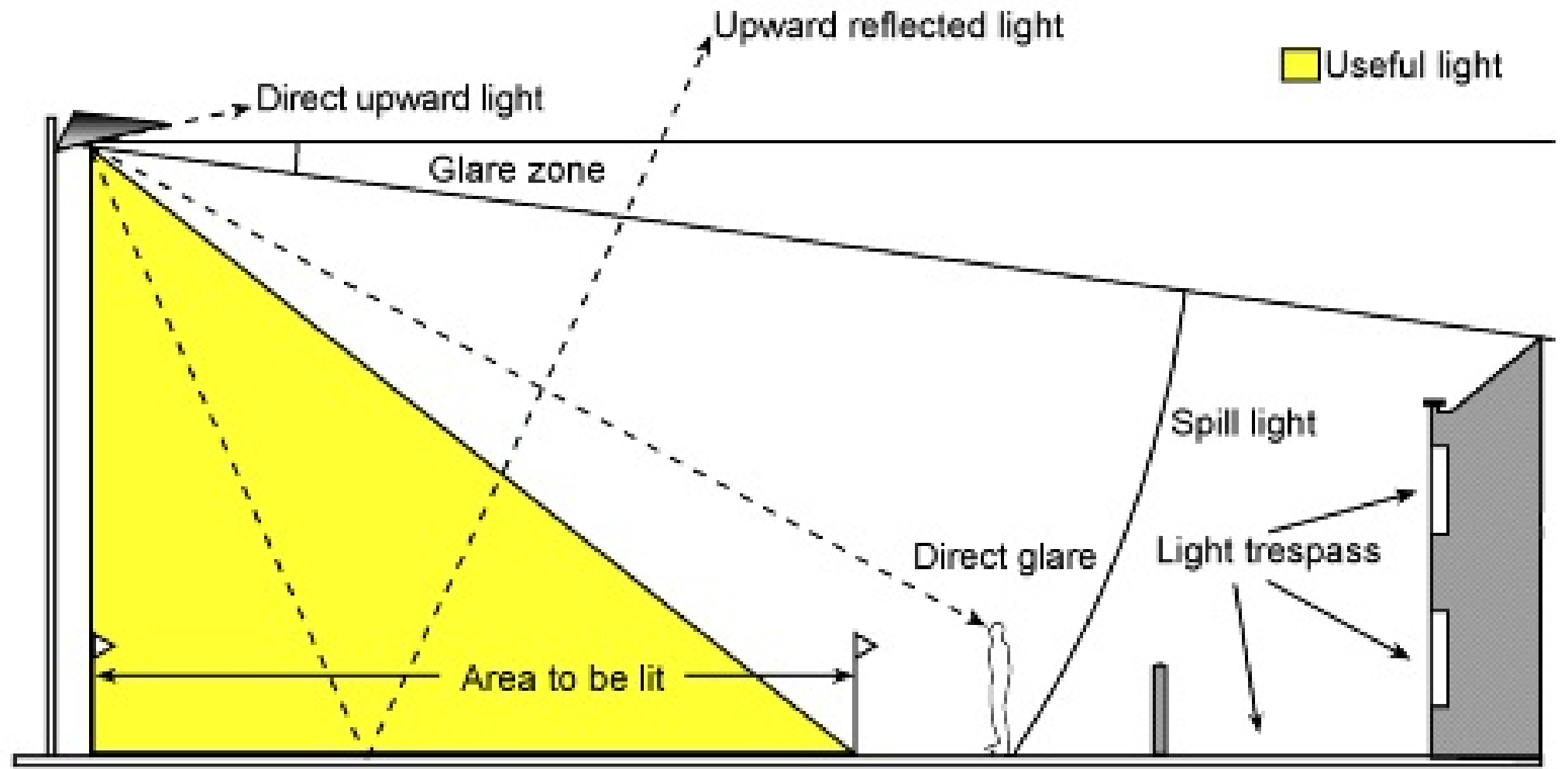
South Road Extension





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AS/NZS 4282:2019



Light pollution is often caused by the way light is emitted from lighting equipment. Choosing proper equipment and carefully mounting and aiming it can make a significant difference.

Light Intrusion

- Light from street lights (especially LEDs) can be very obtrusive
- It's a fact that authorities are not proactive about minimising light spill into our homes
 - should be included as “Standard”
 - shielding is available to prevent light spill into your homes





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AS/NZS 4282:2019

APPENDIX C

IMPACT OF EXTERNAL LIGHTING ON BIOTA

(Informative)

C1 INTRODUCTION

AS 4282 has been referenced from time to time as a conformance condition on proposed developments inclusive of environmental effects, particularly fauna. The visual systems of some biota may be significantly more sensitive to radiation spectra and radiation quantities than the human system and lighting may therefore directly affect predation and survival of a species or indirectly by affecting the availability of an essential food source for a species.

NOTE: Documents referred to in this Appendix are listed in Clause C6.

C2 BIOTA MAY HAVE DIFFERENT SENSITIVITY TO RADIATION FROM HUMANS

Natural light has a seasonal and diurnal rhythm. Light availability is a clock mechanism that determines flowering, mating and hibernation, etc. The presence or absence of light alone, however, may be insufficient and may require combination with other factors such as temperature and moisture to trigger specific activities. Too much light at inappropriate times via artificial lighting may have significant adverse effects on life processes (refer to ALAN 2016 scientific summaries).

The level of illuminance in natural night-time environments exposed to the night sky varies from less than starlight (10^{-4} lx) in leaf litter on a forest floor (Wise and Buchanan, p65) or similar on an overcast night and new moon, to starlight only in the open under a new moon (10^{-3} lx), or brief period peaks at full moon [3×10^{-1} lx (on the horizontal)] in an open environment.

City Streets



Crawford Street - Before replacement



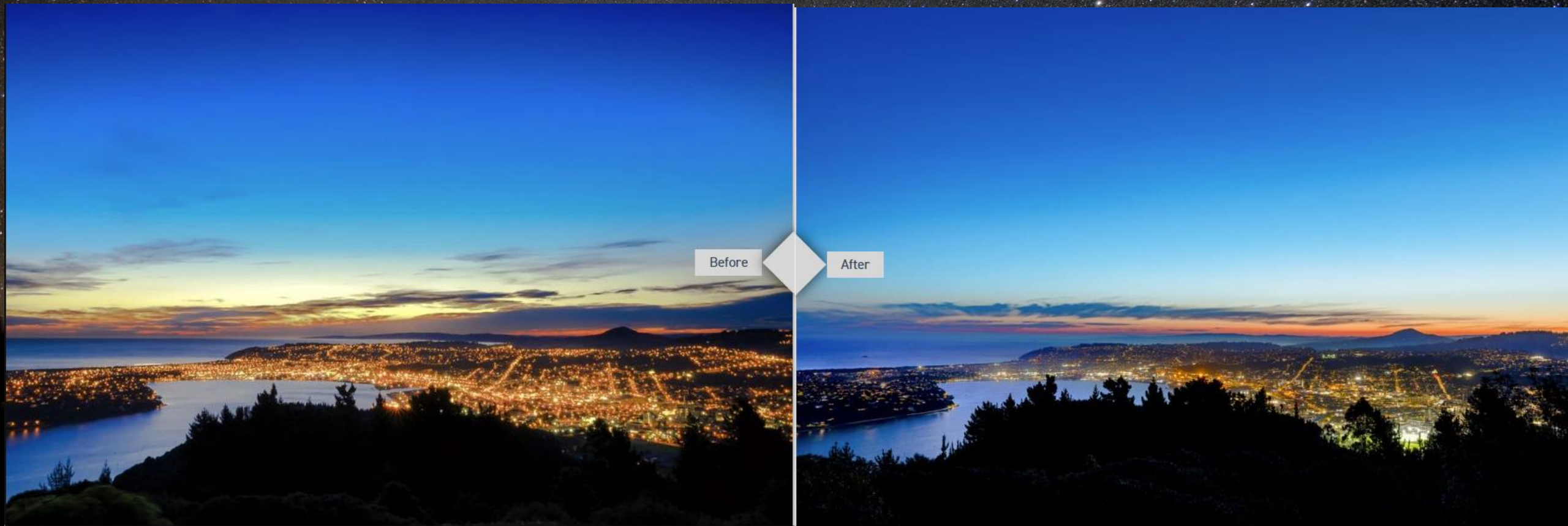
Crawford Street - After replacement

credit: Dunedin City Council



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Dunedin from Signal Hill



Before

After

credit: Dunedin City Council

More Information

- IDA Vic <https://www.darkskyvic.org/>
- IDA <https://www.darksky.org/>