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1 Executive Summary

This report describes street light design considerations for Estero Boulevard, summarizes feedback received from stakeholders and advisory committees, and recommends solutions.

It is the goal of this report to provide information to help Council arrive at a preference for light color (amber, white, or both), and system ownership (utility program, Town-owned, or a combination of both) so the design process can begin.

The uniqueness of the Town of Fort Myers Beach cannot be overstated. The island features protected natural areas near busy commercial zones with heavy tourist traffic. The stewardship of Estero Island includes duty both to the environment and to the residents and visitors of Fort Myers Beach. This mix of tourism and protected natural areas presents the opportunity to provide a unique solution, or rather, two solutions. One size does not fit all.

1.1 Light Color

A choice must be made for light color, i.e., the color of light emitted by the luminaire, prior to beginning a design. The choices are

- White light, best for road-user visibility
- Amber light, best for wildlife
- Both lights (i.e., “dual-source”), with the ability to switch between white light to amber light for turtle nesting season in the same lighting fixture.

Any of the color options above, which are detailed in Section 4, can be designed and implemented. The dual-source option provides year-round achievable accommodation of road users, pedestrians, bicyclists, and wildlife. Furthermore, it offers flexibility into the future as products evolve.

1.2 Lighting System Ownership

A choice must be made whether the Estero Boulevard lighting system will be owned by:

- Florida Power & Light (FPL) or
- The Town of Fort Myers Beach.

Either of the ownership options above, which are detailed in Section 5, can be designed and implemented. A Town-owned system offers the more robust features described in Section 5.2 which are not available with an FPL system. If cost is a primary driver, then an FPL system in most cases provides lower initial and lifetime costs.

2 Purpose

This report describes street light design considerations for Estero Boulevard, summarizes feedback received from stakeholders and advisory committees, and recommends solutions.

It is the goal of this report to provide information to help Council arrive at a preference for light color (amber, white, or both), and system ownership (utility program, town-owned, or a combination of both) so the design process can begin.

3 Existing Conditions

This is the existing system that is proposed to be replaced by the Estero Boulevard Lighting Project. It is a Florida Power & Light Co. (FPL) utility streetlight program system whereby the maintenance and energy costs are paid by a monthly flat fee according to an agreement between the town and FPL.

- The system makes use of existing concrete distribution poles.
- The existing system does not provide adequate light levels, uniformity, or accommodation of wildlife needs; thus, the system is proposed to be replaced. During turtle nesting season many of the lights are turned off, because they are visible from the beach leaving long stretches of dark roadway during the nesting season.

Figure 1 - Existing HPS luminaire on Estero Boulevard

4 Light Color

Street lighting designs are prepared using photometric files from existing manufacturers' products. However, the construction documents must be prepared on a specifications-basis (the construction plans detail the street light specifications so that any product meeting those specifications can be used). This basis is required of all public projects to ensure fair and equal business opportunity to all suppliers that offer a product that meets the specifications.

A choice must be made for which type of lighting equipment best solves the project's lighting goals, within the applicable laws, rules and guidelines. That choice includes deciding which product specifications are important and weighing the pros and cons of each. Specific manufacturers' product examples are shown here, but there is no implication of commitment to that product – only an intention to consider the described *types* of products.

4.1 Choice 1: White LED (4000K)

It is possible to construct an FPL system that is compliant with current lighting criteria by adding lights on poles that do not currently have lights, installing new poles with lights, and adding shielding as needed. Skyglow is controlled by good equipment selection and design. There are well-documented relationships between light color, visibility, and safety,

making white light the preferred option for functionality of drivers, pedestrians, cyclists and all night-time road users.

Within the white light category lies the choice of color temperature ranging from 3000K (warm white) to 5000K (cool white). 4000K is the color temperature recommended by The FDOT for luminaires. Although the luminaire specification section 992-2.4 in the FDOT 2021 Standard Specifications indicates a 4000K maximum, FDOT lighting design training materials identify 4000K as a default, because studies have shown a 20% greater detection distance, meaning a driver can see and respond sooner to, for example, a pedestrian stepping into the street.

The problem with implementing a white-light system during turtle nesting season is, if a turtle disorientation event occurs (e.g., hatchling disorientation or female turtle false crawl), even a properly-shielded light could be suspected as a possible contributor to the disorientation because of a reflection or glow during high humidity, and mitigation would be required.

Figure 2 - Typical white LED luminaire

According to turtle disorientation Geographic Information System (GIS) website myfwc.maps.arcgis.com, data are intended to aid in identifying areas where nesting females or hatchlings are impacted by lights; however, the actual number of animals involved and specific contributing light sources cannot be verified. That means lighting may or may not be the cause of a disorientation; nevertheless, mitigation of a white light is likely to be required after a disorientation event based simply on the light's presence.

- The mitigation for FPL program white lights is most often to turn the light off for the current and future seasons (six months of every year for Estero Island), creating areas of darkness, resulting in a less-safe roadway.
- The mitigation for a town-owned white light could vary, but maintenance or modification attention could be required of a light after every reported turtle disorientation event, and every storm event, creating an undesirable workload for town staff during turtle nesting season.

These mitigation strategies are not usually indicated for amber lighting. For these reasons, white LED lighting is not recommended during turtle nesting season.

4.2 Choice 2: Amber LED (560 nm wavelength minimum)

Amber light (560 nm wavelength or longer) is preferred by FWC, because studies indicate that turtles are less likely to be distracted or disoriented by amber than white light when such light or reflection or glow is visible from the beach. The term "turtle-friendly amber" refers to this color.

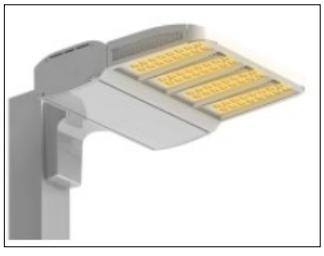

Figure 3 – Typical amber LED luminaire

Amber light is required by FDOT for wildlife sensitive areas. If Estero Boulevard were an FDOT roadway, current FDOT specifications would require that amber lighting be used during

the entire year. This is because federal rules mandate protection of wildlife sensitive areas, specifically turtle nesting beaches, and amber light is the FWC-recommended solution for this protection during nesting season. FDOT specifications do not contain language to accommodate a program by which it can switch to its preferred white light during non-nesting season, so the requirement by FDOT for amber remains in place for all seasons.

Because turtles are federally protected, and FWC, FDOT, and other organizations identify amber artificial light as having less impact than white artificial light has on turtles, amber LED lighting is recommended during turtle nesting season.

4.3 Choice 3: Dual-Source Amber / White LEDs

A dual-source luminaire uses the high-visibility broad-spectrum light (i.e., white light, 4000K light) during the non-nesting part of the year, which coincides with the winter season's increased visitor numbers. The system's control network switches to amber during turtle nesting season to avoid turtle disorientations.

Figure 4 - Typical dual-source amber / white LED

5 Ownership and Controls

A new Estero Boulevard lighting system can be owned by FPL, as is the existing system. Alternately, it can be owned by the Town of Fort Myers Beach, or it can be implemented through an Engineering Service Company (ESCO). All options would be specified with networked lighting control systems with automatic outage reporting. Comparative cost estimates are provided in Section 9 (page 19).

5.1 FPL Utility Program Systems

An FPL lighting system would be specified by preparation of photometric plans and design documents identifying specific luminaires on designated FPL poles. FPL would remove the existing HPS luminaires and install new LED luminaires on power poles according to the design documents, with new poles added where indicated as needed. The ongoing cost of the system would be paid by monthly equipment lease and energy fees. Maintenance and end-of-life replacements would be the responsibility of FPL.

It is estimated that an adequate lighting system would require about two and a half times the number of existing luminaires and could require many additional poles (see *Table 3 – Design Examples and Cost Estimates for Estero Boulevard.*Table 3). New FPL distribution poles would require a contribution in aid of construction (CAIC), an up-front cost to be paid by the town. The resulting lighting system appearance would be similar to the existing power pole line, but with more poles (See Section 9 System Cost Estimates, page 19.

FPL utility program systems are controlled by FPL's network and include a simple on/off control. FPL's network recognizes problems quickly, but response times are not guaranteed.

As with any FPL lighting system, if there is a reported turtle disorientation event and a white FPL light is suspected for any reason, that light is usually turned off during current and future nesting seasons, leaving areas of darkness along Estero Boulevard.

5.2 Town-Owned Systems

A Town-owned lighting system would be specified by the preparation of photometric plans, construction plans and specifications, and those documents being issued for bid and constructed by the selected contractor.

Maintenance would be the responsibility of the Town, its maintenance contractor or its ESCO (see Section 5.3). Maintenance costs are estimated in the Section 9 tables.

A town-owned system would provide more robust control options than simple on/off. The town could implement curfews or dimming for certain areas and / or times based on need which would reduce light levels and produce energy savings on metered connections. It would give the town better control over its operations and maintenance and allow for such improvements as guaranteed response time. Development of a maintenance plan for a town-owned system is included with the Estero Boulevard Lighting Project, should a town-owned system be selected. Town-owned systems can include future enhancements such as Wi-Fi, 5G cellular, electric vehicle charging, gunshot detection, pedestrian detection, color-changing or decorative accents for holidays and events. Some of these enhancements offer potential revenue streams that could help the Town offset system costs.

A town-owned (i.e., non-FPL program) system's capital costs would be borne by the Town with the following exception: Lee County has committed to provide lighting for intersections and crosswalks. Toward this commitment, the County has already installed conduit underground along both sides of Estero Boulevard south of Old San Carlos Boulevard for lighting. The system construction, operation, and maintenance cost divisions between the Town and Lee County remains to be negotiated; however, the County has stated the following preferences:

- If Town-owned, poles must be frangible utility conflict poles.
- Any county-maintained poles would need to be non-decorative, non-painted, spun aluminum, using extended arms to avoid overhead utility conflicts.
    - If decorative poles are used, then the Town would have to maintain them.
- The County needs any fixtures it maintains to be on the FDOT Approved Products List (see Section 6.2).

The Town's portion of lighting system capital costs can be financed directly, or paid over time using an Engineering Service Company (ESCO).

5.3 ESCO Systems

A new lighting system can be financed and maintained through an Energy Services Company (ESCO). ESCOs have low initial costs, because capital costs, maintenance, and energy payments are spread over time. The lifetime costs for systems under ESCO

participation are anticipated to be a percentage greater than town-owned costs. The Estero Boulevard Lighting Project scope includes investigation of funding options. Discussions have begun with ESCOs that service lighting projects.

- Eaton Lighting Services headquartered in Georgia serves projects much larger than the Estero Boulevard Project. Eaton would only consider funding and maintenance of this project if it were combined with another larger project.
- West Florida Trane has a Fort Myers office and may consider funding and maintenance of Estero Boulevard lighting.
- Smart City Capital has an office in Fort Lauderdale and may consider funding and maintenance of Estero Boulevard lighting.
- FPL Energy Services has expressed interested in participating in the Estero Boulevard Lighting project.

6 Risk Considerations

6.1 Legal Risk

It is not possible to predict the existence or extent of every legal risk or exposure related to lighting; however, the scenarios which we have observed to present the greatest risk are those in which a deficiency is noted, a solution is not subsequently implemented, and an incident then occurs. The Estero Boulevard lighting system could be perceived as falling into this category considering the previous study by Team Engineering which found the existing lighting system deficient, followed by the Town's decision to initiate a lighting design project under which the systems deficiency has been confirmed. This, combined with the increasing crash rates over the past two years (see Section 8.2), suggests a sense of urgency to move forward with a lighting solution.

See Attachment 2 – Legal Topics for observations and anecdotal legal information related to lighting.

6.2 Timing and Product Availability

FWC Certification: FWC wildlife lighting certification is recommended, but not required for lighting along Estero Boulevard. It is recommended, because certification eases the design review and permitting process for lighting systems in wildlife-sensitive areas, it communicates the FWC's endorsement of products being appropriate for wildlife protection, and it may provide a level of comfort to the public about the lighting used in their community.

FWC certification involves approval of the product specifications and photometrics and inspection of a physical product specimen. The FWC suspended its Wildlife Lighting Certification Program during COVID and is anticipated to resume the process soon. Once resumed, the

certification process would add one to three months to the design process for products not currently certified and carries the risk of not being approved.

FPL Products: FPL testing is required for products used within the FPL lighting program. It is not required or recommended for town-owned systems. The existing high-pressure sodium (HPS) lighting along Estero Boulevard is an FPL-owned utility program system. The FPL products list includes a subset of wildlife-certified luminaires.

An FPL lighting program system using equipment not FPL-listed must be tested, accepted, and added to the FPL offerings. Inclusion in FPL's offerings requires approval of the product specifications and photometrics, as well as environmental testing of physical product specimens (i.e., salt-spray and electrical surge testing). The test process takes four to six months and carries the risk of not passing the test, or passing but the product not being offered by FPL. Inclusion on FPL's wildlife-certified list requires prior certification by FWC. This risk can be mitigated by establishing clear understandings and acceptance criteria in advance of performing the tests.

FDOT Listing: Any equipment purchased and/or maintained by Lee County must be on the FDOT Approved Products List (APL). (This would not be required of an FPL system.) For a luminaire to be listed on the FDOT's APL, it must meet the requirements of FDOT Specifications Section 991 which, for this project, would require evaluation and acceptance of features listed on the FDOT Wildlife-Sensitive Conventional Luminaire Compliance Matrix. Testing for the evaluation can take a month, and FDOT indicates a 45-day approval for compliant submittals. The risk is evaluation failure. This risk can be mitigated – especially for products in development – by ensuring the products meet the requirements prior to submitting them for testing and evaluation.

Product Availability: Selecting a new product such as the dual-source luminaire carries the risk of that product not being available later for maintenance needs. This risk exists even with the largest, long-established companies and can be mitigated by purchasing spares. The risk is elevated for emerging products, and the mitigation process (i.e., purchasing spares for a town-owned system) is the same.

This risk is reduced with FPL-owned systems. FPL has high confidence of the availability of products on their approved products list. In advance of forecast hurricanes, FPL mobilizes the procurement process for items on the storm material list, including replacement luminaires. After a storm, replacement streetlights are installed after the last electric service is restored, which provides a margin of time for the products to be received.

7 Street Lighting Impact on Human Health and the Environment

7.1 Stakeholder Report

Earlier this year, a report was prepared for and distributed on June 8 to the Estero Boulevard lighting stakeholders. The report responded to stakeholders' questions about the effects of broad-spectrum (white) artificial light, among other topics. The report can be found on the Town of Fort Myers Beach website - https://www.fortmyersbeachfl.gov/documentcenter/view/17403 - and is included in this report as Attachment 5 – Stakeholder and Advisory Committee Outreach.

7.2 Ongoing Research

There is a long-awaited study by the National Academies of Sciences, Engineering, and Medicine titled "LED Roadway Lighting: Impact on Driver Sleep Health and Alertness" (Washington, DC: The National Academies Press). (Link: https://doi.org/10.17226/26097) The report's final conclusion on Page 56 (PDF page 62) is:

> *The results of the present study, although limited in scope, do not support the need to modify the guidelines for LED roadway lighting. It should, however, be noted that roadway lighting (LED and HPS) does have a detrimental effect on sky glow, light pollution, flora, and fauna. Adequate care should be taken to minimize these impacts.*

7.3 Sea Turtle Conservancy (STC)

The Sea Turtle Conservancy (STC) exists to ensure the survival of sea turtles within the Caribbean, Atlantic, and Pacific through research, education, training, advocacy, and protection of the natural habitats upon which they depend. As stakeholders of the Estero Boulevard Lighting Project, the STC has provided a letter advocating the use of amber lighting during the entire year, not only during nesting season. The letter is included as Attachment 3 – Sea Turtle Conservancy Letter.

The STC maintains that amber LED lights are the best solution for the community and the area's federally protected sea turtles, and that a white light is not feasible. White light during nesting season is not the consultant's recommendation. Amber is the recommended light color during nesting season.

The STC letter voiced a concern that amber and white light in the same fixture would result in an imbalance of light levels between the two colors. While most available amber street light luminaires have lower lumen output than white light; however, the luminaires under consideration for Estero Boulevard have similar lumen output and light patterns for amber and white light. The concern that the dual-source would necessitate "the need for more fixtures to adequately light the space" does not apply to the dual-source lights being considered for Estero Boulevard.

The STC stated "these (dual-source) fixtures often malfunction." The concern about malfunctioning lighting controls applies to all lighting systems that use on-off network controls. FPL uses similar technology to turn lights on and off during nesting season on

Estero Boulevard, which has proven reliable. Care must be taken during design to ensure that the failure mode does not default to white light (i.e., luminaires that fail should fail off, or fail to amber).

The STC is concerned that a dual-source luminaire promotes the idea that amber light is unsafe. This concern is shared by the FWC. Research is clear on the visibility benefits to humans of white light, and that is why the recommendation for white light is given for the time of year that turtles are not nesting.

7.4 Marine Resources Task Force (MRTF)

A great deal of input and questions have been received from the Town's Marine Resources Task Force (MRTF) advisory committee, which exists to promote stewardship of marine resources. This includes stopping further environmental damage and rehabilitating Estero Bay and its surrounding waters, wildlife, plant life, and air and water quality. The Task Force's purpose also involves bringing Estero Bay and its surrounding waters and the Estero Island shoreline to the point that they will continue to be the driving force of the Town's economy. The goal is to sustain the quality of life in cooperation with all whose livelihoods or lifestyles depend upon the health of Estero Bay.

MRTF members are stakeholders in the outcome of the Estero Boulevard Lighting project, and in that capacity, its members have expressed a strong objection to any white light or dual-source solution, and a strong preference for amber lighting during the entire year – a preference shared by FWC and STC, with the following supporting (MRTF) statements:

- *FWC should be the guiding force, and we should look within their parameters for lighting.*
- *The biodiversity of our small coastal community is paramount.*
- *Neighboring communities such as Treasure Island have amber lights. Sanibel has no lights along the beach. Longboat Key – all the coastal towns are being driven by FWC requirements (and using amber lights).*
- *The whole issue of white lights vs. amber lights should be – KISS – Keep It Simple Sweetheart. The minimal thing is long wavelength – keep it low, keep it shielded. It seems like that is the simplest thing. Other unapproved items are extraneous.*
- *The idea of adjusting a light after a disorientation has occurred is after-the-fact and not acceptable. An installed system should be simple and not subject to qualifiers, i.e., adjusting a light that causes a disorientation. We should not put up a system that has all these qualifiers on it.*
- *I have done a lot of research about white light, and I can't really find anything that's very good about it.*
- *One hundred years ago, we didn't have bright lights all night long. Our biology and eco-system have not had time to catch up with bright lights. We have developed our island, and we do want to keep some of it natural, and we have a responsibility – a stewardship – to meet this responsibility.*

- *Light management is not a choice between human safety and wildlife survival. There are techniques and products and practices that can ensure everything is beneficial for humans and wildlife.*
- *One pollution affects all living things – not just sea turtles; it affects everything including human beings in many, many ways.*
- *We know that plants rely on the length of night to know what season it is, and when they're going to bud, and when they're going to flower. We know that birds depend on cues from the seasons in order to decide when to nest and when to forage. We know that artificial lights interfere with that.*
- *We know that insects are drawn to light, but artificial lights can produce fatal attractions. We know that people like to fish. If we don't have a good supply of insects, we're not going to have very good fishing around here.*
- *We do have a lot of amphibians on this island – we want to keep them. Frogs and toads are affected by the glare from lights.*
- *Everything that is alive on this island is all interconnected, and we have a responsibility to it.*
- *Extinguishing lights for the turtle nesting season is not a viable option.*
- *A lighting system that includes white lights is simply unwise.*
- *Turtle nesting season has been extended, because our waters have warmed up. If we are going by dates, we are going to have disorientations.*
- *If we are going to have a system that relies on shielding, we are going to have bleed-through, and we will have disorientations. We don't want that, and we can avoid that. All we need to do is go with the minimum amount of light required, which is amber.*
- *AMA recommends lowest color temperature possible.*
- *We would like to conserve our night skies.*

It is not possible to overstate the unique environment of the Town of Fort Myers Beach. The island features protected natural areas juxtaposed to busy commercial zones with heavy tourist traffic. It is critical to protect the natural areas from the effects of encroachment as much as reasonably achievable, and that includes addressing the above concerns expressed by MRTF. It is also critical to provide a roadway that is as safe as reasonably achievable. The street light system must respect the stewardship of Estero Island, which includes duty both to the environment and to the residents and visitors of Fort Myers Beach.

8 Street Lighting Impact on Public Safety

8.1 Public Safety Committee (PSC)

Input has been received from the Town's Public Safety Advisory Committee, which addresses safety and transportation issues for the purpose of health, safety, and welfare of the citizens of and visitors to the Town of Fort Myers Beach.

PSC members are stakeholders in the outcome of the Estero Boulevard Lighting project, and as such, its members have expressed curiosity about the possibility of implementing white lighting during the entire year (i.e., not limited to outside nesting season) – a preference shared by FDOT and Lee County for areas not restricted by federal wildlife protections.

To help Council have adequate information to provide direction about the lighting system, the PSC asked the following questions:

- What is the visibility difference between the Amber and the White light? What is the stopping distance?

  Studies have concluded that 4000 Kelvin (4000K color temperature) light provides about 20% greater detection distance compared to 3000K and 5000K. Greater detection distance means a driver can respond sooner to, for example, a pedestrian stepping into the street. Earlier response increases the likelihood that a collision can be avoided. Roadway visibility studies have not included the warmer, lower color temperatures such as turtle-friendly amber – this is an area that needs research.

  The following figures are examples of different color lighting. Figure 5 is taken from FDOT streetlight training materials and approximates the appearance of various correlated color temperatures (CCT) in Kelvin. The photos in Figure 6, Figure 7, and Figure 8 depict turtle-safe lighting installed in Fort Lauderdale, Florida. Design information was not reviewed for the Fort Lauderdale installation, so although the color is expected to be similar, the photos may not accurately represent the lighting levels or uniformity for Estero Boulevard.

Figure 5 – FDOT streetlight training materials demonstrating the appearance of correlated color temperature (CCT) in Kelvin.

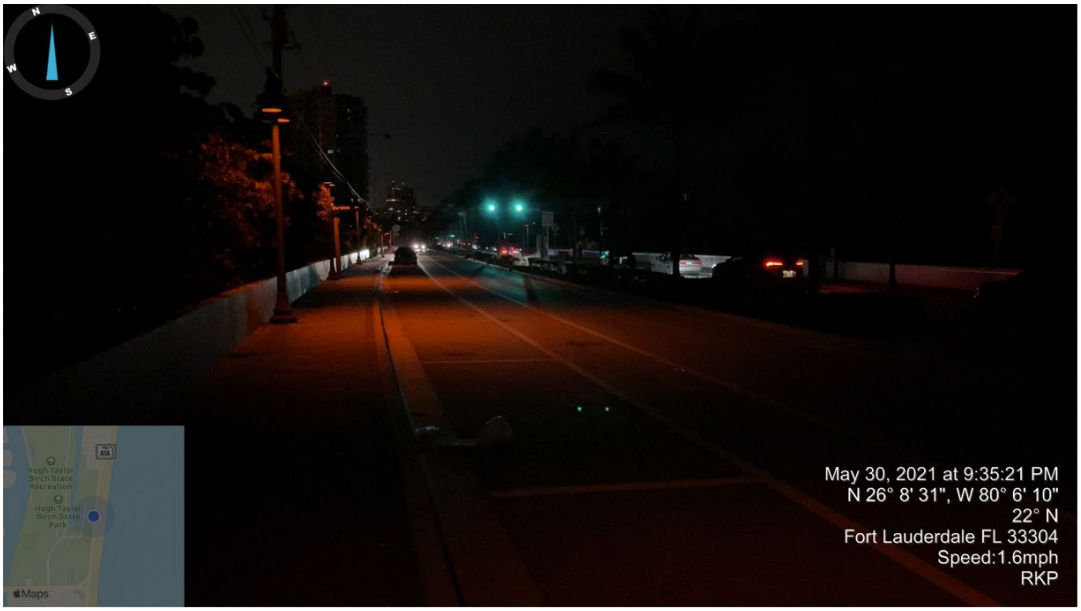

Figure 6 – Amber turtle-safe streetlights in Fort Lauderdale, FL.

Figure 7 – Amber turtle-safe streetlights in Fort Lauderdale, FL.

Figure 8 – Amber turtle-safe streetlights in Fort Lauderdale, FL.

- What do first responders say about light color? An account was provided at the August joint MRTF/PSC meeting: When first responders approach an accident scene where an individual is covered in fluid, it is helpful to discern quickly whether the fluid is motor oil, blood, or gasoline – a determination that is easy under white light, and difficult under amber. While (white) scene lighting is carried on some vehicles, the first priority to an accident is not to set up lights, it's to tend to injuries. The following information was provided to Stakeholders in the June 8 report (Attachment 5 – Stakeholder and Advisory Committee Outreach).

  Lee County Sheriff's Office (LCSO) Input

  - Lighting is our (law enforcement's) friend. The better the light, the better we (responders) can see. We do carry portable light sources, but it's always good to have good lighting.
  - Light color is important for identifying vehicle and clothing color. When we're responding to a report, it helps us know what we're looking for.
  - When describing crime deterrent means, we recommend lighting and cameras as the top two measures.
  - Fort Myers Beach is not considered a high crime area.

  Fort Myers Beach Fire Department Input

  - Lighting is always a good thing [for us]. We have to be able to see house numbers or other markers.
  - Operationally, we have no complaints about the current [level, color] of lighting on Estero Boulevard (High Pressure Sodium).
  - Our concern with lower levels of lighting is more of an issue with safety. Apparatus does carry additional scene lighting which may be set up upon arrival, but use of additional [scene] lighting depends on the nature of the call.
  - We want pedestrians to be able to see. If lighting is removed, or if it is not sufficient to support the pedestrian traffic, then we would not be in favor of that. Lighting needs to be sufficient for the visibility by/of, and security of pedestrians, bicyclists, or any other items on the roadways.
  - Also [there is a] concern with security, as it relates to being able to see video footage, if needed.

- Discuss liability issues as they could represent risk to the Town and suggest a sense of urgency for moving forward with a lighting solution to mitigate those risks. Legal topics are discussed in Section 6.1 and Attachment 2 – Legal Topics.
- Is it possible to design a turtle-friendly system using white light? Yes, it is possible to design such a system, but not feasible to implement. There is no guarantee that every light in the system will be accepted by FWC over the system's life:
  - Under an FPL system, shielding options are limited, and FPL will not make repeated visits if needed to troubleshoot ongoing complaints about a particular

light. The solution for a shielded light whose reflection or glow is suspected to have contributed to a disorientation event would still be to relocate it or turn it off, leaving areas of darkness.

  - Under a Town-owned and managed system, shielding options and troubleshooting resources are greater and more flexible. Nevertheless, any visible white light can be suspected of a reflection or glow that could contribute to a turtle disorientation event, even if the light is miles away from the event. There would be no guarantee that even the best-designed shielding system will be viewed as adequate at every location. This continues the likelihood that some shielded white lights may still be required to be relocated or turned off during nesting season, leaving areas of darkness. See also Section 3.1.

- Are there up-front costs to an FPL system? Yes, although equipment lease, energy, and maintenance costs would be paid monthly for items in the tariff (e.g., luminaires, brackets, light-only poles, etc.), it is anticipated that the lighting design will require additional poles. Any new poles or ancillary equipment not included in the tariff (e.g., poles in the distribution line) represent significant up-front costs. See Section 5.1 FPL Utility Program Systems.
- Approximately 60 streetlights are turned off during nesting season. Is it possible to map the specific lights to disorientation events? Unfortunately, it is not possible to map specific lights to disorientation events or to gauge the effectiveness of turning off lights as this data is not kept by FWC. According to turtle disorientation GIS website at https://myfwc.maps.arcgis.com/apps/dashboards/53699c9690024c079ed60aaa74a763c8, data are intended to aid in identifying areas where nesting females or hatchlings are impacted by lights; however, the actual number of animals involved and specific contributing light sources cannot be verified. That means an extinguished streetlight may or may not have been the cause of a disorientation.
- The PSC asked about the feasibility of using white lights during the entire year, and instead of turning a light off, changing a light associated with a disorientation event to amber. Amber light may be preferable to no light, but there has not been a lot of research in this area. The unknown effects of driving under changing color lights make this approach unadvisable. Similar to year-around white lighting, this approach would be reactive to a disorientation event. Maintenance or modification attention could be required of a light after every reported turtle disorientation event, and every storm event, creating an undesirable workload for town staff during turtle nesting season.
- There is a significant concern about the long-term availability of inventory if the lighting system uses newly developed products such as the dual-source luminaire. This risk is lower with FPL systems, because of the way FPL prepares for and manages its storm recovery materials. See Section 6.2.
- Please provide cost estimates in this format:
  - What would the initial investment be?
  - What would the maintenance cost be?

Answer: Costs are provided in the Table in Section 9 System Cost Estimates with column headings:

- Initial Cost
- Annual Energy kWh
- Monthly FPL Cost Per Luminaire (for FPL programs)
- Annual FPL Program Cost (for FPL programs)
- Annual Energy Cost
- Annual Maintenance Cost
- 30-Year Lifetime Cost

- The PSC requested that sidestreet lighting be addressed. Sidestreet lighting recommendations are within the scope of the Estero Boulevard lighting project; and the topic will be addressed later; however, the purpose of this report is limited to Estero Boulevard lighting.
- Has there been a conversation with the County about what they will or will not allow on their road? Yes, the County will accept the Town's construction plans if they are appropriately signed and sealed. For a town-owned system for which the County may participate in maintenance of crosswalk lighting, luminaires must be on the FDOT-approved products list. The County's level of participation and amount of money committed for crosswalks is unknown. See Section 5.2 Town-Owned Systems.

8.2 Crash Data

Stakeholders have asked to consider whether the new sidewalks installed via the "Refresh Estero Boulevard" project may have improved safety to the extent that lighting levels may be reduced. A traffic study is not part of the lighting project scope, so a complete analysis was not performed; however, crash data were reviewed from the University of Florida's Signal Four Analytics Database. The number of Fort Myers Beach crashes with "Estero Blvd" in the "Crash_Street" field reported in the database for the recent five years are listed below:

Year	Total Crashes Reported on Estero Boulevard	Crashes Involving Pedestrians	Crashes Involving Bicyclists
2021 (only through August)	119	5	2
2020	123	8	3
2019	139	2	1
2018	123	3	2
2017	148	0	5

Table 1 - Recent 5-Year Estero Boulevard Crash History

The numbers of bicycle and pedestrian crashes reported on Estero Boulevard have increased over the past two years, compared to the previous three. The 2021 reports are only through August, i.e., 2/3 of the year. If the crash rate remains constant through December, the 2021 numbers would be expected to increase further through the final 4 months. This is far from a complete study, which would consider other factors such as the possibility of increased use, signifying a lower crash rate per person. If increased use is indeed occurring, that could cause the County to upgrade Estero Boulevard's road classification, which would increase the light level requirement. In any case, the crash numbers do not seem to provide compelling evidence to suggest that the addition of sidewalks would indicate any benefit to reducing light levels.

8.3 Complete Streets

The FDOT's Complete Streets policy adopted in 2014 encourages communities to serve the needs of transportation system users of all ages and abilities while maintaining safety and mobility. Lighting is a component of the mobility and safety aspects of Complete Streets.

More information about lighting's role in Complete Streets is at the following link: https://www.fdot.gov/docs/default-source/transit/documents/FDOTCO_ANationalSynthesisofTransitinCompleteStreets_FinalReport_20180508.pdf

8.4 Vision Zero

Vision Zero is a strategy to eliminate traffic fatalities and severe injuries. The Vision Zero Network consists of stakeholders in public health, transportation planning and engineering, policy, law enforcement, community advocacy, and the private sector. The network has identified lighting as an important strategy for improving safety that should be considered in Vision Zero planning and implementation.

Vision Zero lessons learned about improving pedestrian safety and helping drivers, include using the right light (i.e., more light is not always the right answer), using sensor technology and connected operations, and using data analytics to better understand factors that compromise road safety. FDOT shares the national traffic safety vision, "Toward Zero Deaths," and formally adopted its own vision of the national vision, "Driving Down Fatalities."

More information about lighting's role in Vision Zero is at https://visionzeronetwork.org/focus-on-lighting/.

8.5 What is "Safe?"

It is important to understand that the idea of safety is not a binary construct of "safe" and "un-safe." It is nuanced. It is arrived at after careful consideration of costs and benefits. The recommendations of this report are aimed at getting to "safer," meaning maximizing the positive effects (road-user safety) while minimizing the negative effects (wildlife impact) of light.

9 System Cost Estimates

The tables on the following page compare photometric results and cost estimates for lighting systems typical of those under consideration. Remember, street lighting designs are prepared using photometric files from existing manufacturers' products; however, the construction documents must be prepared on a specifications basis so that any manufacturer's product meeting those specifications can be used.

In these tables, notations such as "Note 1" and "Note 2" will guide the reader to more information and cost bases which are found on page 21.

								Illuminance			Lumiannce			Glare	
Example	Manufacturer	Luminaire Model	Mounting Height (ft.)	Spacing (ft)	Lumen Output	Power Input, Watts	Color (Note 1)	E_{avg}, Lux	Avg/ Min	Max/ Min	L_{avg}, (Cd/M^2)	Avg/ Min	Max/ Min	Veiling Luminance Ratio	Notes
A	Cooper	OVY20SXX3E	25	280	17,701	225	HPS	16.05	10.6	26.7	1.23	3.7	10.8	0.45	Note 2
B	eLuminaire	ALQ-3M-17-150-4K7-SCALED	25	95	17,000	150	4000K	30.4	2.4	3.5	2.41	2.7	4.9	0.23	Note 3
	Dual-Source	ALQ-3M-17-185-E17-AMBER-SCALED	25	95	16,000	200	Amber	30.4	2.4	3.5	2.4	2.7	4.9	0.3	
C	Cree	PL15854-001 RSWX9021& - FnRpt	25	71	6,111	141	Amber	13.6	1.8	2.5	1.01	1.66	2.5	0.24	Note 4
D	Visionaire	BLX-II_8_T3_256LC_5_TS	25	109	12,900	430	Amber	20.3	1.7	3.45	1.5	2.0	4.6	0.29	Note 5
E	Howard	LM63_LRM1 80W T3 4K	25	128	12,223	80	4000K	17.07	3.55	8.29	0.99	2.3	5.14	0.25	Note 6
							Lee County Design Criteria →	**8.6**	**4.0**		**0.8**	**3.0**	**5.0**	**0.3**	

Table 2 – Design Examples and Typical Photometric Results for Estero Boulevard.

Example	Owner	No. of Luminaires (Note 7)	Additional poles required (Note 8)	Initial Cost (Note 9)	Annual Energy (kWh)	Monthly FPL Fee Estimate per Luminaire	Annual FPL Program Cost (Note 10)	Annual Energy Cost (Note 11)	Annual Maintenance Cost (Note 12)	30-Year Fees, Energy and Maintenance	30-Year Lifetime Estimate (Note 13)	Portion Toward Crosswalks (Note 14)	Lifetime Carbon Tons (Note 15)
A	FPL	130		$0	117,439	$14	$21,840	$0	$0	$655,200	$655,200	$372,960	2,491
B	FPL	428	126	$2,520,000	300,724	$25	$161,664	$0	$0	$4,849,920	$7,369,920	$981,932	6,378
	Town		-	$3,950,000		-	$0	$24,058	$15,989	$1,201,396	$5,151,396	$601,799	
C	FPL	556	254	$4,440,000	313,644	$15	$123,264	$0	$0	$3,697,920	$8,137,920	$852,787	6,652
	Town		-	$4,680,000		-	$0	$25,092	$20,767	$1,375,765	$6,055,765	$544,583	
D	FPL	380	78	$1,800,000	656,051	$25	$147,264	$0	$0	$4,417,920	$6,217,920	$939,107	13,915
	Town		-	$3,570,000		-	$0	$52,484	$14,197	$2,000,422	$5,570,422	$732,950	
E	FPL	331	29	$1,065,000	106,317	$25	$132,564	$0	$0	$3,976,920	$5,041,920	$882,579	2,255
	Town		-	$3,340,000		-	$0	$8,505	$12,367	$626,181	$3,966,181	$599,121	

Table 3 – Design Examples and Cost Estimates for Estero Boulevard.

Notes are on the following page.

Notes:

1. HPS color is about 2200K.
   4000K is the color of white light recommended for best visibility.
   Amber is the wildlife-friendly color and is expressed in wavelength (i.e, 560 nanometers) and can be approximated at around 1700K.
2. This is the existing FPL High Pressure Sodium (HPS) lighting system, included for the purposes of comparing the new systems. The spacing shown is average over the entire project, including the lights off during turtle nesting season. Energy and maintenance costs are included in the monthly FPL fee.
3. These two calculations show the amber and 4000K (white) light results of the dual-source luminaires. The two rows represent a single dual-source luminaire. The lumen output is similar for both colors. The limiting criterion for this luminaire's spacing is glare. The power consumption is calculated using 175W, which is the average of the white / amber draw.
4. The Cree luminaire is an example of a turtle-friendly amber luminaire that is currently certified by FPL and FWC. The lumen output is lowest, and the number of these luminaires needed is highest.
5. This Visionaire luminaire is an example of a currently FWC-certified amber luminaire. It uses an older, lower efficacy LED chip. Its high lumen output is achieved by its high power use (430W).
6. Howard is another manufacturer developing a dual-source amber/white luminaire based on this distribution.
7. The number of luminaires is not assumed to differ from FPL or Town owned systems, because the pole spacing is determined by design criteria. New poles estimated to be needed for an FPL system are part of the system's initial cost. Luminaires includes one luminaire per pole-spacing over 6.8 miles (project limits), plus 50 additional luminaires estimated to light 42 crosswalks. Fixture counts are different from those previously submitted to MRTF and PSC, owing to refinement of assumptions for crossings and FPL system costs).
8. Additional Poles Required are estimated as the approximate number of new poles needed to accomplish the lighting design minus the estimated number of existing poles suitable for lighting use (i.e., in the right place with space for a light attachment).
9. Initial Cost for a Town-owned system is the construction cost. This up-front cost can be financed by the town, or through an ESCO (See Section 5.3 ESCO Systems). Initial costs for an FPL system are for the additional poles needed to meet lighting criteria.

   Town-owned costs are based on manufacturers' product budget estimates together with FDOT's Item Average Unit (construction) Costs Statewide in 2020.

   FPL initial costs are based on an estimate of how many additional poles may be needed to accomplish a Lee County criteria-compliant design. A pole added within the distribution line costs about $15,000 with significant additional costs associated with attaching

distribution electric lines to the poles. For this estimate, all new poles are assumed to be in the pole line – a worst case scenario. Poles outside the distribution line are estimated to cost about $4000, plus possible additional monthly rental fees for other appurtenances.

Ongoing costs for FPL systems are based on the tariff rates and are subject to Public Service Commission approved rate adjustments.

Except for the special amber and dual-amber/white luminaires, all construction and finishes are per standard FDOT specifications. Decorative options and finishes are generally not available with FPL systems. Decorative options and finishes would increase the initial cost of town-owned systems.

10. Annual FPL Program costs for new systems are estimated as 12 x Monthly FPL Fee Estimate per Luminaire x No. of Luminaires, plus 50 light-only pole rentals for crosswalks at $8/mo per pole.
11. Energy estimate is based on $0.08/kWh.
12. Maintenance estimate is based on replacement of each light once over the system's lifetime ($1800), plus $4/year per luminaire for network services (backhaul, reporting, data storage, etc), and a 5% touch rate per year @ $200 ea. Maintenance for FPL systems are included in the FPL fees.
13. 30-Year Lifetime estimate is a simple sum of initial costs plus 30 years of fees, energy, and maintenance. No adjustment was made for future value, inflation, interest, premature failure, and accidental or deliberate damage. FPL systems are maintained so that components that fail are replaced on a continuous basis, making its lifetime indefinite. The FPL system estimate is calculated over 30 years, to be consistent with the other cases presented.
14. Portion Toward Crosswalks: Estero Boulevard is a Lee County Roadway, and their level of participation and amount of money committed is unknown. It is estimated that about 50 additional luminaires will be required for lighting crosswalks. To assist with future negotiations with Lee County regarding the cost of lighting crosswalks, the "Portion Toward Crosswalks" is calculated by the lifetime cost x 50/(total luminaires) plus estimated pole rental (42 crosswalks x $8 pole rental per crosswalk for FPL systems). Note that Lee County has already installed conduit for lighting along both sides of Estero Boulevard south of Crescent Street to Estrellita Drive, the cost of which could accordingly reduce the County's crosswalk lighting costs.
15. Carbon calculations are based on an estimated 7.09 × 10-4 metric tons CO2/kWh. Carbon contributions from equipment manufacture and installation methods were not considered.
16. Green row highlights are just for ease of reading across the tables.

10 Summary

The uniqueness of the Town of Fort Myers Beach cannot be overstated. The island features protected natural areas near busy commercial zones with heavy tourist traffic. The stewardship of Estero Island includes duty both to the environment and to the residents and visitors of Fort Myers Beach. This mix of tourism and protected natural areas requires a unique solution, or rather, two solutions. One size does not fit all.

It is a fortunate aspect of the Town's unique setting that turtle nesting season coincides with the time of year when there are fewer visitors; and the peak tourist season occurs outside of turtle nesting season.

Estero Boulevard is a Lee County Roadway, and their level of participation and amount of money committed is unknown.

10.1 Light Color

A choice must be made for light color, i.e., the color of light emitted by the luminaire, prior to beginning a design. The choices are

- White light, best for road-user visibility
- Amber light, best for wildlife
- Both lights (i.e., "dual-source"), with the ability to switch between white light to amber light for turtle nesting season in the same lighting fixture.

The pros and cons of each can be distilled down to the following two questions:

Question 1: If 4000K lighting is recommended by FDOT as being the best for nighttime visibility, then why should the town consider amber lighting?

Question 2: Since FWC and FDOT lighting recommendations for wildlife-sensitive areas include amber lights, a recommendation that we can assume is safe for people, then why should the town consider white lighting for our wildlife-sensitive areas?

The answer to both questions is designers must balance the needs of all stakeholders by weighing the benefits, costs, and risks of each choice.

Any of the color options above, which are discussed in Section 4, can be designed and implemented. The dual-source option provides year-round achievable accommodation of road users, pedestrians, bicyclists, and wildlife. Furthermore, it offers flexibility into the future as products evolve.

10.2 Lighting System Ownership

A choice must be made whether the Estero Boulevard lighting system will be owned by:

- Florida Power & Light (FPL) or
- The Town of Fort Myers Beach.

Either of the ownership options above, which are detailed in Section 5, can be designed and implemented. A Town-owned system offers the more robust features described in Section 5.2 which are not available with an FPL system. If cost is a primary driver, then an FPL system in most cases provides lower initial and lifetime costs.

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Attachment 1 – Project Extents and Typical Sections

The Estero Boulevard lighting segments correspond to the Refresh Estero Boulevard construction segments, with the addition of "Segment 0" the town-owned roadway north of Segment 1.

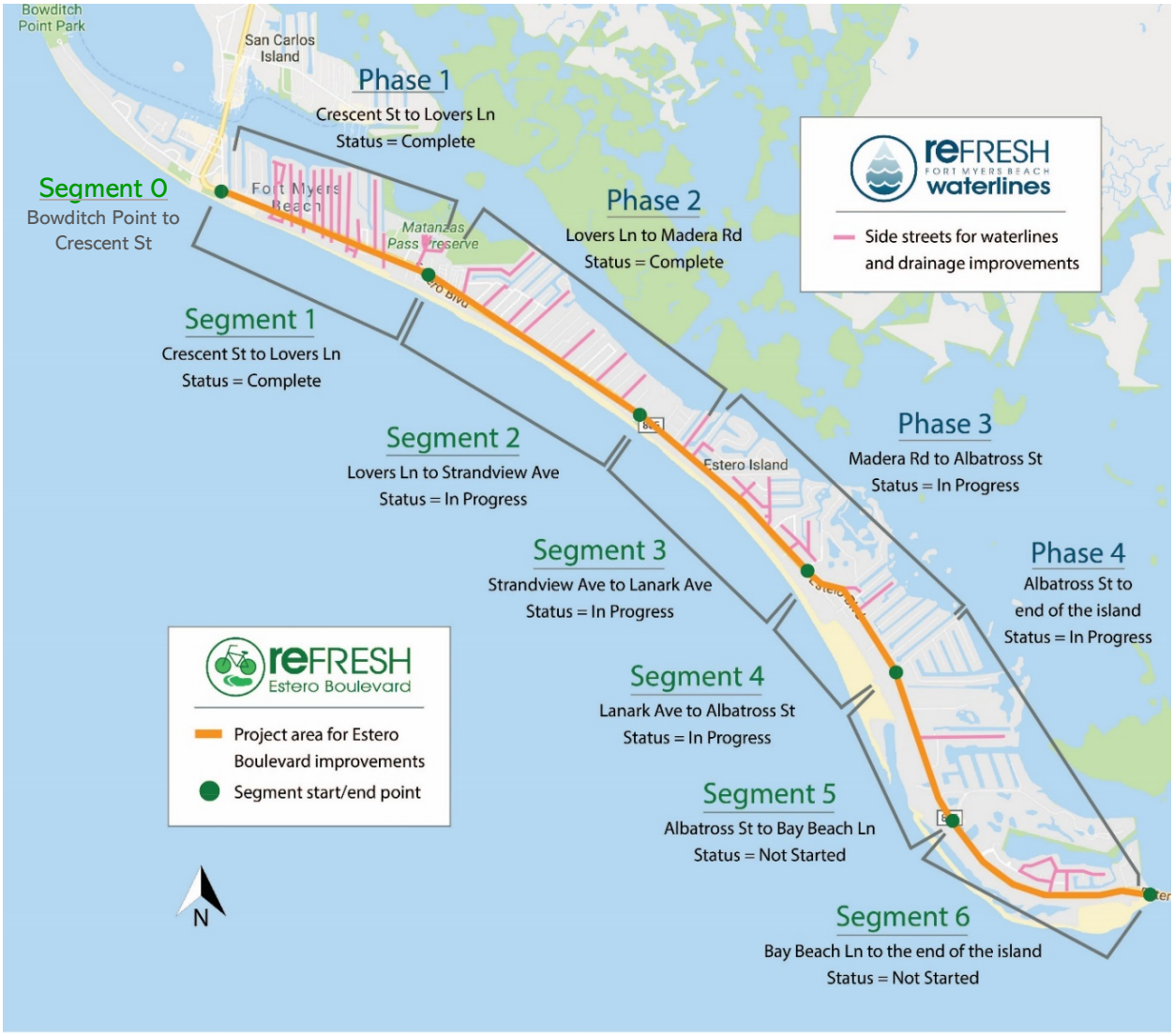

Figure 9*: Project Segments (Refresh Fort Myers Beach www.refreshfmbeach.com)*

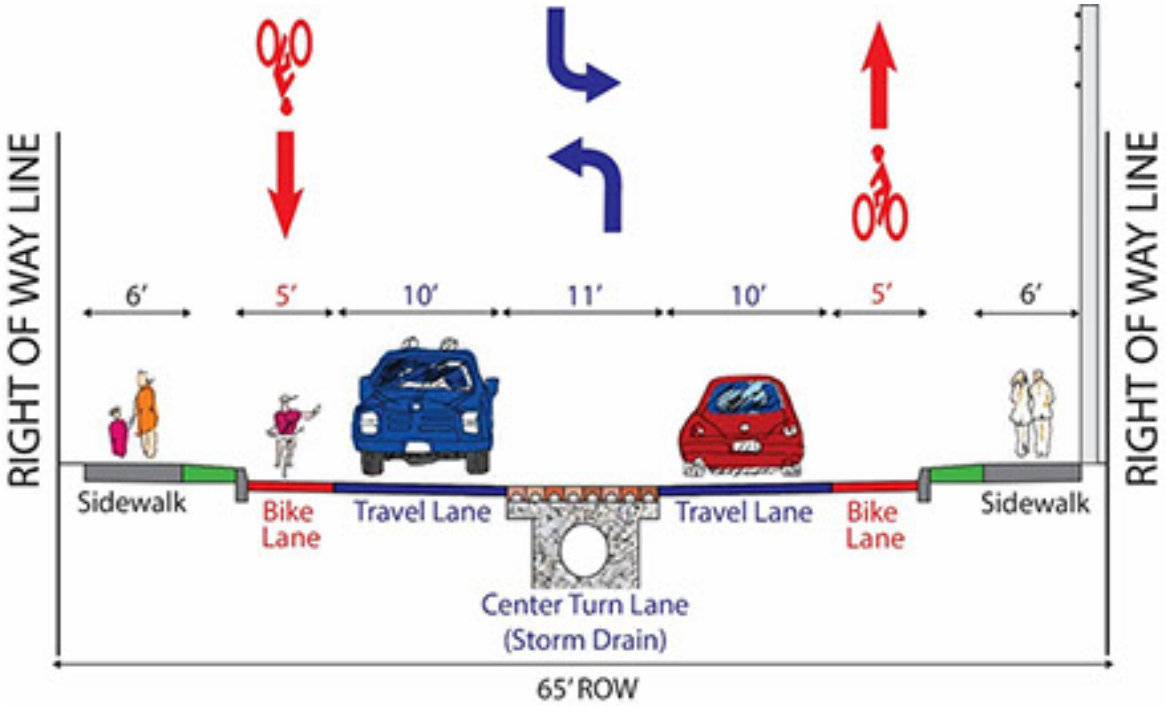

Figure 10*: Typical Section (Refresh Fort Myers Beach www.refreshfmbeach.com)*

				Widths (feet)											
Segment	Location	Functional Class	Length (ft)	West Sidewalk	West Buffer	West Bike Lane	West Travel Lane	Center / Turn Lane	East Travel Lane	East Bike Lane	East Buffer	East Sidewalk	Travel Lane Width	Total Width	Right-of-Way
0	Bowditch Pointe to Crescent St	Local	5659	6	8	5	10	0	10	5	8	6	20	58	
1	Crescent St to Lovers Lane	Minor Arterial	5650	9.5	0	0	10	11	10	0	0	9.5	31	50	50'
2	Lovers Lane to Strandview Ave	Minor Arterial	6200	6	4	5	10	11	10	5	4	6	31	61	65'
3A	Strandview Ave to Glenview Manor Dr	Minor Arterial	1700	6	0	5	10	11	10	5	0	6	31	53	Varies 57.5 to 65'
3B	Glenview Manor Dr to Lazy Way	Minor Arterial	2500	6	4	5	10	4	10	5	4	6	24	54	Varies 50-57'
3C	Lazy Way to Lanark	Minor Arterial	1550	6	4	5	10	11	10	5	4	6	31	61	65'
4A	Lanark to Flamingo St	Minor Arterial	1400	6	4	5	10	11	10	5	4	6	31	61	65'
4B	Flamingo St to Albatross St	Minor Arterial	2050	8	4	5	10	11	10	5	4	10	31	67	100'
5	Albatross St to Bay Beach Ln	Minor Arterial	3900	8	4	5	10	11	10	5	4	8	31	65	80' Typically
6	Bay Beach Ln to Estrellita Dr	Minor Arterial	5200	8	4	5	10	11	10	5	4	8	31	65	80' Typically

Table 4 Typical Section Dimensions

Each of the Estero Boulevard segments has different cross-sectional dimensions as shown in Table 1 above, and there is some dimensional variation within the segments. The dimensions affect the spacing and selection of luminaires. For example, a wider roadway might require

closer spacing, or a luminaire with a different distribution type to help light reach farther across the road. In the final detailed design, luminaires will be selected and located as needed to meet design criteria for all parts of Estero Boulevard. For today's analysis, a conservative average cross section is used to estimate fixture counts and costs.

Attachment 2 – Legal Topics

To assist the Town and its legal advisors in making its own legal risk assessment, we have compiled the following information on legal topics:

Florida Statute 768.1382

Florida Statute 768.1382 states the following provisions which apply to the state and its political subdivisions (cities, towns, villages, etc.):

- Patrols for non-functioning lights are not required.
- Providers have a minimum of 60 days to repair a light once properly notified.
- The lighting provider cannot be held liable if the terms of the statute are met.

Joint and Several Liability, typically called “Deep Pocket”, refers to situations where multiple parties contribute to an injury, and the plaintiff can choose who should pay the entirety of damages. It is then up to the chosen payer to collect from the other defendants, regardless of the amount of responsibility and the ability of the others to pay.

The state of Florida abolished Joint and Several Liability in 2006, and it was replaced with Comparative Liability, where the estimated percentage of liability is used to calculate each defendant’s share of the awarded damages and it the responsibility of the plaintiff to collect from each defendant.

Legal Cases We Have Seen Related to Lighting

Here are examples of issues we have observed in our own professional experience:

- In Arizona, Individual versus a City and Utility Company: In this case, an individual, a pedestrian, was struck and injured by a motorist at a marked crosswalk at dusk where the orientation of the photocell on a dusk-to-dawn utility program luminaire was in question. The accountability was complicated by the fact that the city was in the process of transferring ownership of the light to the utility, and maintenance had been recently performed by the utility. The city proposed an undisclosed-amount settlement agreement which resulted in the dismissal of the case, and the utility did not have to contribute to any settlement.
- In the Southwest United States, a family versus a state DOT and a county (case pending): A pedestrian was struck and killed by a vehicle while crossing a state highway at night after 9:00 PM that was not lighted. There was a lighted intersection about 200 to 300 feet away. The county and state are being sued by the deceased's family. The driver of the vehicle has claimed that they did not see the pedestrian crossing the street. No citation was issued, nor were charges filed against the driver.

Traffic-Related Settlements Advertised by a Law Firm

The following table is a sample of the traffic-related settlement results achieved by a single Florida law firm (Jack Bernstein, Injury Attorneys). Information about assignment of fault, time-of-day, or lighting condition is not available for these cases, nor is settlement information

available for the accidents that have occurred on Estero Boulevard. The purpose of this information is to demonstrate the magnitude of settlements that can occur when accidents happen. If a public agency is found to be partly or entirely at fault because of a faulty light, then the agency risks bearing part or all of the settlement costs. These costs are in addition to legal fees and the cost of accident response and other losses which can range between $4,000 and $10 million, depending on the severity (FHWA Report FHWA-SA-127-071: Crash Costs for Highway Safety Analysis.

Amount of Settlement	Case Type	Injury
$3,000,000	Motor Vehicle Accident	Death
$3,000,000	Truck Accident	Neck Injuries
$3,000,000	Auto Accident/Products	Death
$2,225,000	Auto Accident	Death
$1,748,000	Auto Accident	Head Injuries
$1,425,000	Auto Accident	Foot Ankle Injury
$1,000,000	Auto Accident	Wrongful Death
$780,000	Motorcycle Accident	Foot Injury
$750,000	Auto Accident	Neck Injury
$700,000	Motor Vehicle Accident	Neck Injury
$685,000	Auto Accident	Death
$650,000	Auto Accident	Ankle Injury
$600,000	Motor Vehicle Accident	
$600,000	Car Collision	Neck and Back
$600,000	Auto Accident	Head Injury
$575,000	Auto Accident	Leg Injury
$560,000	Auto Accident	Back Injury
$500,000	Motor Vehicle Accident	
$500,000	Motor Vehicle Accident	Hip Injury
$500,000	Auto Accident	Back Injury
$470,000	Pedestrian	Hip, Back, Foot, and Shlder
$450,000	Drunk Driver	Neck Injury
$400,000	Car Collision	Back and Shoulder
$400,000	Car Collision	Total Body
$400,000	Car Collision	Total Body
$385,000	Motor Vehicle Accident	Back Injury
$375,000	Auto Accident	Head Injury
$325,000	Motor Vehicle	Neck Injury
44 additional cases between $100,000 and $300,000 90 additional cases between $50,000 and $100,000		

Table 5 Crash Settlement Examples

Attachment 3 – Sea Turtle Conservancy Letter

SEA TURTLE CONSERVANCY
SINCE 1959
Formerly Caribbean Conservation Corporation

July 22, 2021

Town of Fort Myers Beach
Public Safety Advisory Board and Marine Resource Task Force

Dear Task Force Members:

Sea Turtle Conservancy (STC) applauds the Town of Fort Myers Beach for taking on the task of updating its coastal street lighting along Estero Blvd. and considering the use of long wavelength street lighting to protect the area's threatened and endangered sea turtles. After reviewing the consultant's lighting recommendations for Estero Blvd., STC maintains that amber LED alternatives (either the Cree or Visionaire option) are the best solution for the community and the area's federally-protected sea turtles.

The white LED alternative consultant recommendations are not feasible. Many of the existing Florida Power and Light (FPL) high pressure sodium lights are turned off during sea turtle nesting season to prevent disorientations because they are not long wavelength (>560 nm). White LED fixtures would also need to be turned off during nesting season, making these new fixtures only useful for six months of the year. Although the "dual source" white and amber LED fixtures seem like a perfect alternative, STC does not recommend using these fixtures for several reasons. First, because these fixtures contain both white and amber diodes on a single fixture, the fixture will not have the same light output as a strictly white or strictly amber fixture, necessitating the need for more fixtures to adequately light the space. Secondly, despite programmable timers, these fixtures often malfunction, leading to the white diodes switching on during nesting season, which could disorient sea turtles. Finally, this change back and forth between white and amber LEDs further pushes the incorrect perception that wildlife lighting is bad or unsafe, which is not the case at all. Lighting codes and recommendations can be achieved using long wavelength fixtures.

Nearby communities are successfully upgrading their coastal street lights to protect sea turtles. In May, the City of Treasure Island, in partnership with Duke Energy and Florida Department of Transportation (FDOT), installed eight amber LED street lights along Gulf Blvd. and plans to replace more street lights in the near future using sea turtle friendly amber LED fixtures. FPL (formerly Gulf Power) in Pensacola Beach successfully installed sea turtle friendly amber LED fixtures along Ft. Pickens Road, a busy pedestrian and tourist area. As mentioned in the consultant's recommendations, nearly 300 turtle friendly solar street lights will be installed on Lido Key in Sarasota County. As Florida's sea turtles face increasing anthropogenic threats, addressing problematic lighting is one of the most effective ways for local governments to reduce their impact on sea turtle recovery. By choosing the amber LED alternatives, the Town of Fort Myers Beach will be taking a proactive approach and joining these communities as stewards for one of Florida's most iconic and imperiled species.

Sincerely,

Stacey Gallagher
Development Coordinator/Sea Turtle Lighting Project Specialist
Sea Turtle Conservancy

4581 NW 6th Street, Suite A, Gainesville, FL 32609 P: 352.373.6441, F: 352.375.2449 stc@conserveturtles.org
www.conserveturtles.org

Attachment 4 – Standalone Solar Lighting System

Figure 11 - Sarasota's proposed solar lighting system.

There is a lighting project in Sarasota at South Lido Key Beach with 270 light pole units at 18' mounting height that is proposed to use solar power. The Town has requested that this option be included in the system comparisons. A PowerPoint presentation about the project was reviewed. The presentation implies that the selected option includes a solar array on top of each light pole. The project's PowerPoint photos represent a roadway cross section that is comparable to many of the Estero Boulevard segments, so a rough estimate per mile of the system's lifetime costs provide an estimate of the lifetime cost of a similar system for Estero Boulevard per-mile, if the photos and calculations providing the basis for claims in the PowerPoint presentation are accurate.

Extrapolating the costs per mile of lifetime ownership for Fort Myers Beach would be greater than $11 million for the "Standalone Solar Pole Lighting System with Integral Batteries" option in the presentation. Standalone means there is no backup connection to the grid.

Not addressed in the solar lighting project's PowerPoint are estimates of total energy consumption and concerns related to damage caused by harmonic frequency vibrations from wind loads on the projected area of a solar panel atop a light pole, as well as the luminaire and bracket. There is not enough information available in the PowerPoint to assess the feasibility or appropriateness of Sarasota's project for the Town of Fort Myers Beach, nor is there a basis for construction costs given.

Construction drawings for the project were provided and were reviewed. The drawings did not include details of the light pole and solar panel structures, so the characteristics of the projected solar panel area and structural support cannot be evaluated.

Attachment 5 – Stakeholder and Advisory Committee Outreach

The attached report was provided to the Estero Boulevard Lighting Stakeholders on June 8, 2021. It describes the history of the discussions up to that point, including answers to important questions about lighting quality and color.

Table of Contents

1 Background

The Town of Fort Myers Beach and its consultant are working toward improving the streetlight design for Estero Boulevard. The scope of work includes recommendations for side street lighting.

An important step toward the lighting design success is to seek, receive, respond to and accommodate as much as possible the input from project stakeholders into the design. To this end, the Town's consultant presented information about lighting in general, and the project in particular at four public meetings:

March 24, 2021 Stakeholder (kickoff)
https://www.youtube.com/watch?v=40aWSiB-lhs

May 13, 2021 Stakeholder
https://www.youtube.com/watch?v=O8l_3zjqHhU

May 18, 2021 Public Safety Advisory Committee (PSC)
https://www.youtube.com/watch?v=SG9vcf-Ex4k&t=4s

May 19, 2021 Marine Resources Task Force (MRTF) Advisory Committee
https://www.youtube.com/watch?v=vhtxxfgCS3Y

The consultant received feedback during the meetings, and subsequent written feedback in emails and on informational handouts provided for that purpose (Attachment 8.1). The Public Safety and Marine Resources Task Force Advisory committees held subsequent special meetings to discuss the outreach document topics so the committees could provide unified feedback (Attachments 8.2 and 8.3)

This document describes the stakeholder and advisory committee feedback and answers questions received during the outreach activities. The feedback content and topics are grouped into the following general categories:

- Scope
- Light Levels
- Light Color
- Safety and Security
- Other Concerns

2 Scope

The project scope was briefly described as lighting design along Estero Boulevard, not including the Times Square area, and recommendations for side streets. The following topics arose:

2.1 Side street lighting uniformity now is poor, and it doesn't feel safe riding a bike at night with light and dark spots (PSC).

Methods for improving lighting uniformity on side streets will be included in the consultant's final report recommendations.

2.2 Recommendation: Use traffic-calming and safety techniques that do not include the use of artificial light or that keeps the use of such light at extremely low intensities. Suggested alternatives to lighting are pedestrian-activated crosswalk lighting, bike lane separators (physical bumpers), reflective paint, etc. (Soft Lights)

Answer: The use of lighting is one of many toolkit methods to improve safety. The combination of lighting and non-lighting measures is especially applicable at crosswalks, and the consultant will work with the County to provide recommendations for crosswalk treatments.

Also noted is the PSC concern that the county's design of crosswalk solutions might wait and follow behind the consultant's Estero Boulevard lighting system selection, creating design inconsistencies. The consultant is working alongside and concurrently with Lee County to ensure the main road and crosswalk designs are coordinated.

2.3 Lee County Sheriff's Office (LCSO) Input

- **Lighting is our (law enforcement's) friend. The better the light, the better we (responders) can see. We do carry portable light sources, but it's always good to have good lighting.**
- **Light color is important for identifying vehicle and clothing color. When we're responding to a report, it helps us know what we're looking for.**

- **When describing crime deterrent means, we recommend lighting and cameras as the top two measures.**
- **Fort Myers Beach is not considered a high crime area.**

2.4 Fort Myers Beach Fire Department Input

- **Lighting is always a good thing [for us]. We have to be able to see house numbers or other markers.**
- **Operationally, we have no complaints about the current [level, color] of lighting on Estero Boulevard.**
- **Our concern with lower levels of lighting is more of an issue with safety. Apparatus does carry additional scene lighting which may be set up upon arrival, but use of additional [scene] lighting depends on the nature of the call.**
- **We want pedestrians to be able to see. If lighting is removed, or if it is not sufficient to support the pedestrian traffic, then we would not be in favor of that. Lighting needs to be sufficient for the visibility by/of, and security of pedestrians, bicyclists, or any other items on the roadways.**
- **Also [there is a] concern with security, as it relates to being able to see video footage, if needed.**

3 Light Levels

3.1 Question: Where do the Lee County lighting criteria come from? (MRTF)

Answer: The 1.0 footcandle criteria for minor arterials (such as on Estero Boulevard) is based on the American Association of State Highway Transportation Officials (AASHTO) Roadway Lighting Design Guide GL-7 (Reference 7.1). The AASHTO guide is written for agencies (states, counties, cities, towns, etc.) to use for designing roadway lighting systems within their jurisdiction. AASHTO works together with the Illuminating Engineering Society (IES) which publishes the widely used roadway lighting design guide RP-8 (Reference 7.3), for substantial consistency between the guidance documents.

3.2 Question: Does the barrier island of Fort Myers Beach need the brightness stated in the Lee County criteria that originated from the Federal AASHTO guide which also applies to big cities like Chicago? (Stakeholder)

Answer: The light levels indicated in the AASHTO guide (Reference 7.1), similar to other national lighting guides, vary according to roadway functional classifications (e.g., local, collector, arterial, etc.) and level of pedestrian activity, not the size of the city; though large cities are likely to have more roads with higher classifications. The

considerations for determining roadway functional classifications involve such features as access points, route spacing, speed limits and traffic volumes, number of travel lanes and other qualities. Estero Boulevard's characteristics south of San Carlos are considered by Lee County to fall under the Arterial classification (1.0 footcandle).

3.3 Is more lighting the solution to glare from oncoming headlights? (PSC)

Answer: Sometimes, but not always. The definition of glare from (ANSI/IES LS-1-20) (Reference 7.5) is:

> *The sensation produced by luminances within the visual field that are sufficiently greater than the luminance to which the eyes are adapted to cause annoyance, discomfort, or loss in visual performance or visibility.*

Note: The magnitude of the sensation of glare depends on such factors as the size, position, and luminance of a source; the number of sources; and the luminance to which the eyes are adapted.

This two-part definition first implies the greater the ratio of unwanted light to useful light, the greater the sensation of glare. The second part notes that the sensation of glare depends on a lot of other factors. Well-designed street lighting helps to overcome the effects of glare from oncoming headlights when it provides useful illumination of the road and doesn't create more glare.

3.4 Question: Can you provide data on the risks and dangers of glare. (PSC)

Answer: (See item 3.3 above for glare definition). It is well-known that glare interferes with visibility and therefore safety. It is the intention of every good lighting design to minimize glare – in fact, there is a metric for disability glare in the lighting calculation called "veiling luminance" with limits on acceptable values (Reference 7.3, Section 10.5.1). The limitation constrains the amount of light reaching the eye from the light source to be a small fraction of useful light reaching the eye from the illuminated area, i.e., the pavement, vehicles, pedestrians and other objects. For concerns related to human health and light's effects on human circadian rhythm and sleep cycles, see item 4.5 below.

3.5 Why does the presentation cite the 2016 FDOT Greenbook graphic (for light levels) when there is a more current [design manual] with added wildlife areas of concern (MRTF)?

Answer: The 2016 Greenbook (Reference 7.6) was cited because it is the most current revision of that document, and it shows the lighting illuminance criteria for minor arterials (such as Estero Boulevard) as 1.0 footcandle. Table 231.2.1 of the 2020 FDOT Design Manual (Reference 7.9) also indicates the 1.0 footcandle

criterion, and the same table indicates 1.0 to 1.5 footcandles for arterials and collectors with wildlife-sensitive lighting.

Section 231.2.1 of the 2020 FDOT Design Manual, "Wildlife-Sensitive Conventional Lighting," continues with the guidance:

> *(2) "Design lighting system using luminaires from the Wildlife-Sensitive Conventional Lighting category of the APL."*

According to the 2020 FDOT Design Manual, Wildlife-Sensitive Conventional Lighting products are amber lights. See item 3.6 below.

3.6 Is the Estero design required to follow this (Item 3.5 above) FDOT roadway guidance? (MRTF)

Answer: The consultant's consideration of a dual-source (amber/white switchable by season) solution would require negotiation with FDOT for allowance of an amber/white dual-source luminaire if Estero Boulevard were FDOT-owned. Estero Boulevard is not an FDOT road. It is owned by Lee County and the Town of Fort Myers Beach; therefore, rather than work with FDOT, the consultant is working with the County and the Town to investigate the feasibility of using a product that provides better visibility than that offered by amber lighting. The final design may use products from the current APL's Wildlife-Sensitive Conventional Lighting category, but at this point, early in the design, a broader selection is being considered.

In any case, every light that is visible from the beach must be amber during turtle season, and the light's point source will be shielded regardless of the color.

4 Light Color

4.1 Given that FWC has approved 560nm and 590nm outdoor lighting, we do not understand why high color temperature lighting is being considered for Estero Island. (Soft Lights)

It is important to note that if amber light were best for safety and visibility, it would be recommended throughout the state for all situations throughout the year, but it is not. The reasons high color temperature lighting is being considered for Estero Island are:

1. Visibility is better; therefore, safety is improved. People see better under broad-spectrum lights. 4000 Kelvin is the default FDOT light color requirement per FDOT Specifications 992 (Reference 7.7) because it is identified as having the highest visibility benefit, providing about 20% greater detection distance compared to 3000K and 5000K. (Reference 7.14). See Figure 1. Greater detection distance means a driver can respond sooner to, for example, a pedestrian stepping into the street. Earlier response increases the likelihood that a collision can be avoided.

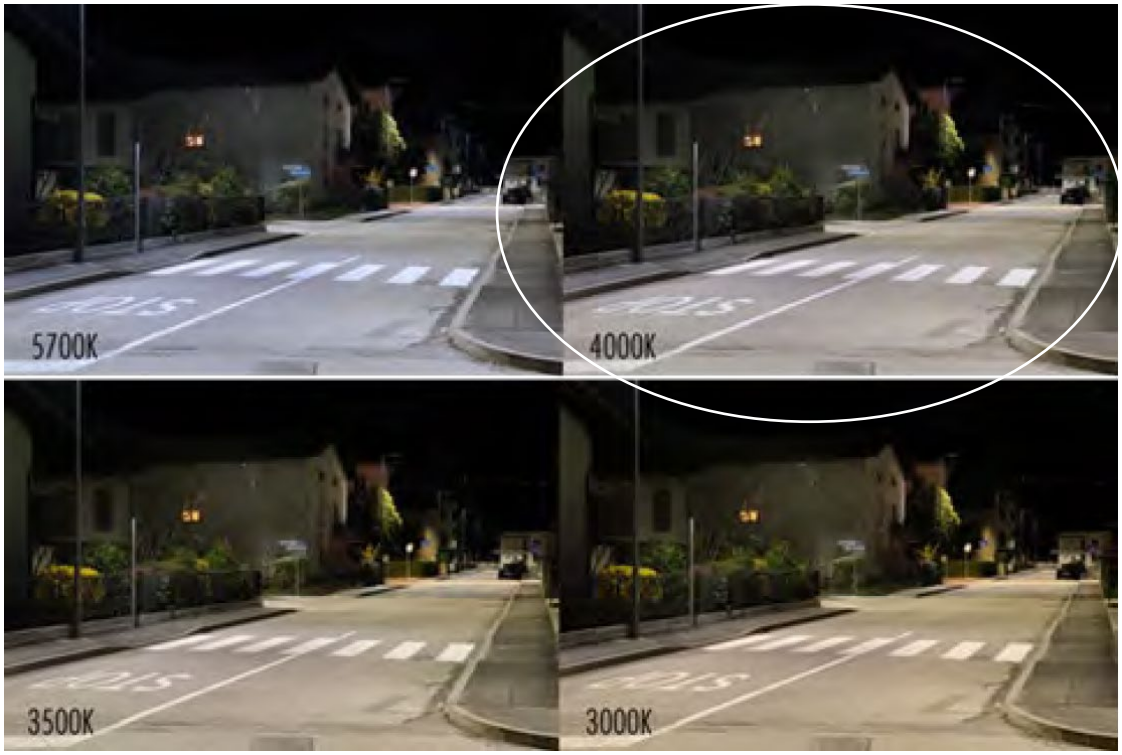

Figure 1 - 4000K is the default FDOT requirement.

2. Energy efficiency is greater. The stakeholder outreach form included a table roughly comparing the energy costs between some products being considered. The table shows how designing with amber can lead to 192% more energy costs than an equivalent High Pressure Sodium design, and four times more than a design using 4000K. Higher lumen output products are also being considered. Other feasibility factors of newer products are being investigated such as the likelihood of inventory availability in the longer term.
3. Carbon footprint is lower. Following on the lower energy costs is the lower carbon footprint for broad spectrum lighting proportional to the energy increase. Amber lights can have four times the carbon impact as broad-spectrum lights.
4. Initial costs are lower. Notice the (Qty) column in the table (Figure 2). The bottom row shows 561 luminaires on poles would achieve the same light levels that could be accomplished with 146 4000K luminaires. That would make the initial (capital) costs for Amber roughly 4 times greater than a design with currently approved amber luminaires.

Luminaire	Source	Lumen Output	Power W	Qty.	Total Power W	KW	kWh for 11h/day	kWh for 365 days	Annual Energy Cost	Energy Cost Difference
Cooper OVY Series	200W HPS	17,000	240	175	42,000	42.0	462.0	168,630	$16,863	Similar to today
eLuminaire 4000K	LED	17,000	146	140	20,440	20.4	224.8	82,067	$8,207	49% (less)
eLuminaire Amber	Amber LED	16,500	470	140	65,800	65.8	723.8	264,187	$26,419	157% (more)
Cree-RSW-AMBER	Amber LED	5,300	144	561	80,830	80.8	889.1	324,533	$32,453	192% (more)

Figure 2 - Comparative energy costs: Amber is highest.

5. It is more useful to first responders. Broad-spectrum light is more first-responder friendly because of the better color-rendition. First responders have shared with us that it IS important to be able to see colors to identify people and vehicle color, and that is not possible under amber lighting as shown in Figure 3. See LCSO and Fire Dept input under Items 2.3 and 2.4 above.

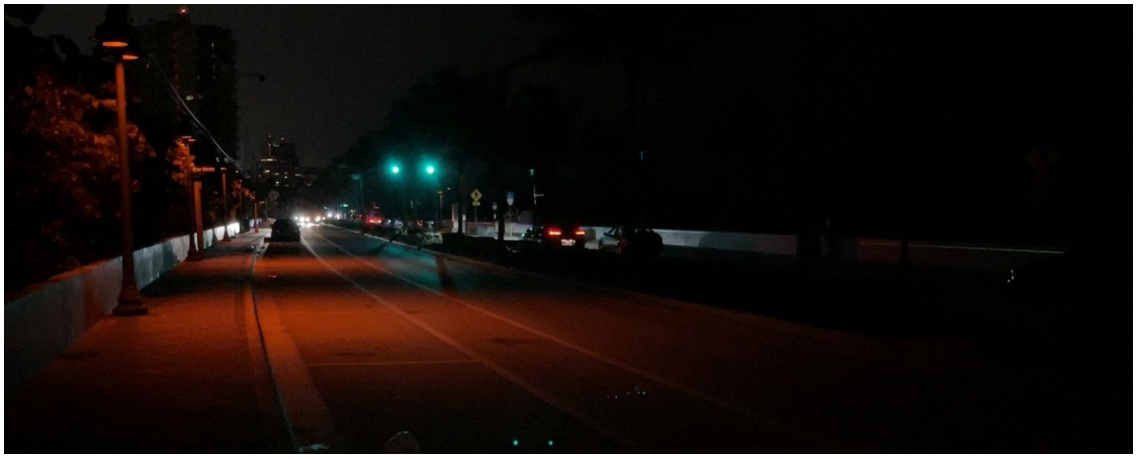

Figure 3 – A1A Lighting: Amber does not allow perception of different colors

4.2 The appearance of having to choose between humans and turtles depending on the season is an unacceptable position. (PSC)

Answer: Federal and State laws mandate the protection of sea turtles, and that is why amber is being considered when visibility of the light from the beach cannot be prevented by shielding or other means. In every other case, such as when lights can be effectively shielded, and during times when the turtles are not nesting, we are not restricted by law to using amber; instead, we can follow the default FDOT recommendation to use 4000K light for optimal visibility (Reference 7.7). The broad-spectrum versus amber selection is a way to use the best achievable visibility solution allowed by law at all times.

Also noted and agreed is the PSC's recommendation that the best possible alternative for pedestrians, cyclists, and vehicle operators should not be reduced during turtle season and that uniformity throughout is important.

4.3 Question: Are there any other lighting solutions besides narrow-band, amber LED lighting that satisfy marine sea-turtle regulations? (MRTF)

Answer: The narrow-band amber LED light color is required at every location where light is visible from the beach. There are ways to mitigate (i.e., reduce or block) the visibility of lights from the beach, but because there are many areas of clear visibility from the beach to Estero Boulevard, the turtle-season solution may require at least some amber LED lights.

4.4 Question: How are the lighting visibility studies created in other cities and countries relevant to Fort Myers Beach? (Stakeholder)

Answer: Lighting visibility studies analyze the human optical response and physical response times under controlled conditions and are not geographically dependent.

4.5 Question: Can you provide references supporting the statement that the AMA's recommendation to limit light color to 3000K should not be applied to street lighting? (Stakeholder, MRTF, Soft Lights)

Answer: The Illuminating Engineering Society (IES) document PS-09-17 (Reference 7.12). responded to AMA CSAPH Report 2-A-16, "Human and Environmental Effects of Light Emitting Diode (LED) Community Lighting." (Reference 7.2) In it, the IES affirmed its alignment with the AMA in support of proper conversion of outdoor area and roadway lighting to LED light sources, with proper optics and shielding to reduce glare and light trespass. The IES disagreed with the limitations on spectral content for outdoor area and roadway lighting emphasizing that, while the principal motivators were understandable, there was not sufficient supporting information, and recommended a more comprehensive analysis of the public health impacts of outdoor and roadway lighting prior to adopting policies that could have a negative effect on the safety of drivers and pedestrians.

The National Electrical Manufacturers Association (NEMA) published a lighting systems document LSD 55-2017, "Outdoor Lighting and Human/Animal Factors : An Industry Evaluation" (Reference 7.16), wherein NEMA acknowledged sharing the same fundamental concerns as many do regarding the need for energy conservation, dark sky preservation, mitigation of potential ecological impacts of outdoor lighting, and the growing body or research that seeks to understand and explain the effect of the circadian cycle on human and animal health. NEMA members support the ongoing efforts of the IES, the International Dark-Sky Association, and the United States Department of Energy (DOE), as well as initiatives that minimize the amount of outdoor electric lighting needed to achieve functionality that reduces unnecessary stray light. NEMA Lighting Systems Division members communicated significant

concerns with published materials portraying outdoor lighting as contributing to a negative nighttime environment without giving due consideration to all the factors involved, and the existing body of scientific research. The document cites the Rensselaer Polytechnic Institute Lighting Research Center (LRC) response to the AMA report (Reference 7.17) stating several studies have documented that the required exposure to higher color temperature "blue" light to the retina is extremely unlikely to be achieved under outdoor lighting conditions.

4.6 Question: If 4000K LED streetlights are added, would that increase skyglow to an extent roughly proportional to the number of lights added? (Stakeholder, MRTF)

Answer: Not necessarily. Skyglow can be limited or reduced by proper lighting design and shielding.

4.7 Question: Are the (FPL) 3000K and 2700K luminaires available now? (Stakeholder).

Answer: The current FPL LED Catalog (Reference 7.10) contains 3000K streetlight products, and no 2700K products.

4.8 Question: What are our neighboring Floridian coastal communities doing for streetlights in wildlife-sensitive areas? (Stakeholder, PSC, MRTF)

Answer: Some of the neighboring communities' streetlight solutions in wildlife sensitive areas are:

- The City of Treasure Island installed a trial of eight amber LED luminaires in collaboration with Duke Energy (i.e., on power utility poles). See Figure 4. The installation was approved by FWC, and the City is planning to add 80 more. Treasure Island police and fire departments have expressed opposition to the amber installation. The light quality has been subjectively described as "muddy," similar to low pressure sodium, with poor discernment of color. The trial luminaires were not on Duke Energy's approved light list, a favorable sign toward the possibility of the Town of Fort Myers Beach project introducing new utility program products for Estero Boulevard. Both utility and non-utility program systems are being considered for Estero boulevard.
- Sarasota county uses low pressure sodium luminaires where turtle friendly lighting is required.
- Siesta Key had installed a test streetlight installation of Amber LED luminaires several years ago through the FPL street lighting program; however, it has since been removed. Today, luminaires visible from the beach are turned off.

Figure 4 - Treasure Island test installation. Reference 7.11.

- Siesta Key has installed pushbutton-activated flashing beacons at crosswalks.
- Siesta Key public parking lots are lit with amber LED decorative luminaires with 270° beach-side shielding on 14 ft poles.
- Bradenton Beach installed a test installation of amber LED luminaires several years ago through the FPL street lighting program, however, it has since been removed.
- Ft Lauderdale Beach installed an amber LED streetlight system along A1A, replacing some existing broad-spectrum lights with amber lights on utility poles on the landward side of A1A, and new decorative pedestrian-level amber LED lights on the beach side in other areas. See Figure 3 above.

4.9 Statement: [Visibility to Estero Boulevard is] wide open at our beach access. A corridor of white light can attract the hatchlings and disorient the mother sea turtles because they can see underneath and between buildings [and reflections from buildings and other structures]. A corridor of white light is not the answer. (Stakeholder)

Answer: It is required to shield light sources from beach visibility, no matter whether the light is white or amber. If it is not possible to shield the source and the volume of light in the air between the luminaire and the pavement, then amber lighting will be required during turtle nesting season.

4.10 There is a relatively large contingent on the beach that understands and rejects white light and would like to ensure there is consideration for an IDA compliant, narrow-band amber lighting solution for the Town on a full year basis. (Public)

Answer: Narrow-band amber lighting is not the only IDA-compliant type of lighting, as is demonstrated by the darksky.org example of a successful before/after implementation of Dark-Sky measures (Figure 5). IDA principles for responsible outdoor lighting focus on purpose, limiting light to the locations and brightness needed, and limiting the amount of shorter-wavelength light to where it's needed (Reference 7.13).

Figure 5 - Example of a successful Dark-Sky conversion project using non-amber lights at darksky.org/get-involved/

5 Lighting Extents

The topic of lighting extents refers to how much of the roadway and its surrounds are to be illuminated, i.e., only the roadway, the roadway and sidewalk, or the roadway, sidewalk and property to the building, sometimes centerline-to-keyhole (considered to have some security benefit). The consultant's recommendation was to light the roadway and sidewalk because:

1. Lighting sidewalks would provide better visibility of pedestrians, for better advance indication of their travel direction.
2. There is no apparent desire to light property behind the sidewalk toward buildings.
3. Crime prevention is not a main goal of the lighting project.

The PSC recommendation was also to light the roadway and sidewalk; MRTF recommendation is to light the roadway to sidewalk.

On the topic of lighting and crime, the following comments were received.

5.1 The following studies conclude that street lighting does not reduce crime. (Soft Lights)

1. ***The Effect of Reduced Street Lighting on Crime and Road Traffic Injuries at Night (England and Wales)*** **https://www.ncbi.nlm.nih.gov/books/NBK316511/.**
2. ***Streetlights and How They Relate to Crime (Houston)*** **https://kinder.rice.edu/sites/default/files/documents/Kinder%20Streetlights%20and%20Crime%20report.pdf.**
3. ***Outdoor Lighting and Crime, Part 1: Little or No Benefit (Australia)*** **http://asv.org.au/downloads/Outdoor%20Lighting%20and%20Crime,%20Part%201.pdf.**

Answer: The comment is responding to the consultant's reference to a US Department of Justice guide, "*Improving Street Lighting to Reduce Crime in Residential Areas*," (Reference 7.18). The guide advises that reductions in crime can be achieved by improvements in street lighting, and the improvements can reduce crime during the day and night.

The three studies cited by the commenter raise doubts about the correlation of crime increases and/or reductions to nighttime artificial lighting.

1. The England/Wales study investigated the effects of removing or dimming lights. Although it recognized that adding lighting seemed to reduce the occurrence of road collisions, the study found no evidence of reductions in traffic collisions or crime as a result of reducing or dimming outdoor lighting. The study further cautions against generalizing the results, since its overall conclusions varied across contexts. Some study areas where lighting appeared to reduce crime were more deprived areas, and part-night lighting was only associated with decreases in burglary and vehicle crime in less-deprived areas.
2. The Houston study found that the observed reduction in crime (one percentage point decline) cannot be confidently linked to the presence of lighting, since the relationship between streetlights and crime is complicated and includes such factors as density, activity, and the presence of opportunity. The authors of this study did not identify themselves or the sponsor of the study. There is no statement of context or evidence of peer review as is required by such national organizations as the National Academies of Science.
3. The Australian study concluded that although artificial light at night tends to allay the *fear* of crime, any deterrent effect on *actual* crime is difficult to investigate because of pervasive extraneous influences.

All three studies recognize that the link between lighting and crime varies with context and is integrated with many other factors. All three studies acknowledge that other

lighting effects were not studied, e.g. feelings of security, appearance of pride or neglect from adding or removing lights, respectively.

The commenter cited four additional studies:

- An Australian astronomical society study stating that although lighting allays fears of crime, the correlation between lighting and crime rates is not evident.
- A news report stating that thefts and burglaries in a Swedish municipality were halved in the months after lights were darkened because of a billing dispute with the municipality's energy company. A contributor postulated that it may be because people were staying indoors more.
- A Canadian astronomical society study stating that although lighting allays fears of crime, the correlation between lighting and crime rates is not evident.
- An International Dark-Sky Association information sheet indicating that campuses lighted at night encourage assembly and therefore vandalism.

All of the above-cited reports, studies, and articles are multifaceted documents, and it is not the intent of this outreach document to completely analyze, confirm, or refute any of them. They can all provide input and considerations for the Town of Fort Myers Beach–the most important of which is that the link between lighting and security depends on context.

It has not been a goal of the Estero Boulevard Lighting Design Project to resolve security problems. The main goal of the Estero Boulevard Lighting Project is to improve pedestrian and bicyclist safety. Nevertheless, please see LCSO and Fire Department input under Items 2.3 and 2.4 above.

5.2 There is a sight-distance concern surrounding too many additional poles; placement of poles may interfere with vehicle operators' ability to see pedestrians and cyclists as the vehicles are exiting driveways onto Estero Boulevard.

Answer: The FDOT Access Management Guidebook (Reference 7.8) includes the "sight triangle" as an important consideration for any roadway design project involving vertical elements such as poles, control cabinets, structures, or landscaping. Designs are prepared to minimize or eliminate sight distance problems.

6 Dark-Sky Concerns

6.1 Question: Does light equal pollution? (MRTF)

Answer: Light falling outside the area intended to be illuminated is light-trespass when it crosses a property line or right-of-way. Unwanted light trespass is considered by some to be pollution. LED lighting is far superior to previous technologies in its ability

to direct light to the intended area with less spill light (trespass) than was generally possible with HPS. Well-designed lighting that is provided to improve safety of pedestrians, bicyclists, and drivers is generally not considered to be pollution.

6.2 Does the consultant team have Dark-Sky design experience (MRTF)?

Answer: Yes.

6.3 Statement: None of the existing standards (e.g. IES RP-8, FDOT Greenbook, etc.) would be applicable for LED lighting. (Soft Lights)

Answer: All the cited standards are applicable to LED lighting. All promote LED technology as the most efficient light source with no concerns about application.

Abney's Law of additivity states that the total luminance composed of a mixture of wavelengths is equal to the sum of the luminance of its monochromatic components. This provides the basis for color mixing of light, such as R, B, & G colors being used to create white and other colors of light. Two examples are being able to see white light, and viewing of a rainbow. The same principle allows non-homogeneous sources to mix light and appear homogenous at distances greater than 100 times the size of the source (this is approximate based on light control elements). For LEDs this is 4 inches. ANSI/IES standards require that outdoor luminaires be photometrically tested using far-field photometry (Reference 7.4). This dictates a test distance of luminaire/source to photodetector of 25 feet minimum. At this distance, discrete LEDs (single die) appear as point sources. These are generally mounted in arrays. The size of an array may approach that of an HID lamp. Regardless of the size or shape of the light source, the design goal is to provide uniform lighting while limiting direct view of light by drivers, pedestrians, and sea turtles.

6.4 The Americans with Disabilities Act (ADA) prohibits discrimination against light-sensitive persons. The design of streetlighting must not harm sensitive receptors. (Soft Lights)

Answer: Without debating the ADA applicability to light sensitive persons, the design and products will comply with applicable federal, state, county, and local laws.

6.5 Statement: In most cases, the poor application of lighting will not contribute to a sense of safety and community. (Soft Lights)

Answer: The designation of poor lighting is a subjective qualification. There is no context to respond to this statement without defining good versus poor application of lighting. The sense of security and community varies from individual to individual for a given lighting condition. Each person has their own psychological response to their environment. What one person considers glary and annoying, others prefer as a good security light for their residence as evidenced by millions of security lights being installed in the U.S. alone. When surveyed in groups, people tended to agree that

more lighting felt more secure at night. This response was generally consistent in the range of 1 to 5 footcandles (fc). Further increases above 5 fc were unlikely to improve perceptions of safety and security (Reference 7.14).

7 References

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7.11 Hawley, Catherine, Fox 13 Tampa Bay, “Treasure Island Installs Sea Turtle-Friendly Lights In Time for Hatchling Season,” April 26, 2021, https://www.fox13news.com/news/sea-turtle-friendly-lights-installed-in-time-for-hatchling-season-on-treasure-island.

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7.13 International Dark-Sky Association (IDA), “Five Principles for Responsible Outdoor Lighting,” April 2020, https://www.fpl.com/content/dam/fpl/us/en/landing/pdf/led-catalog.pdf.

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8 Attachments

TOWN OF FORT MYERS BEACH
ESTERO BOULEVARD LIGHTING PROJECT
ADVISORY COMMITTEE OUTREACH

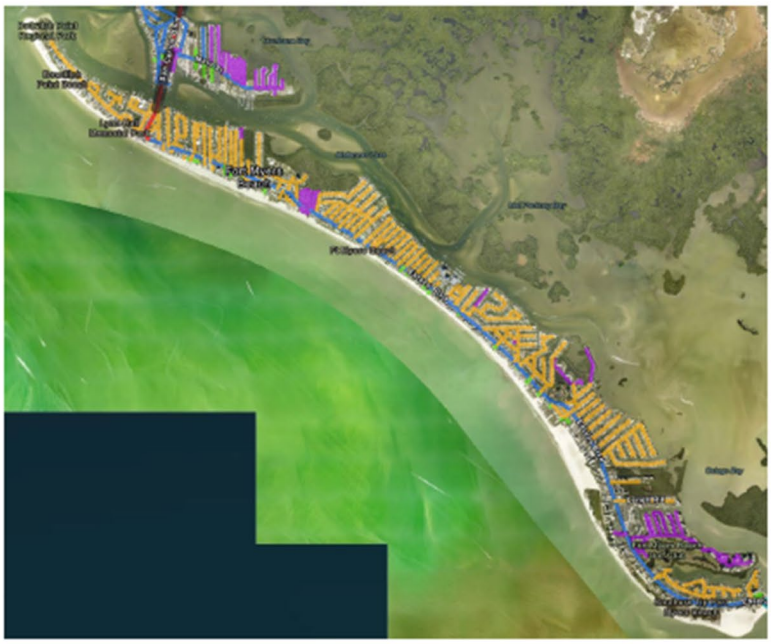
1. **Introductory Video (6 minutes)**
2. **Project Scope Details**

2.1 Street lighting design for Estero Boulevard
- North of San Carlos Blvd: Town Owned
- South of Crescent Blvd: County Owned

2.2 Special attention to the 45 crosswalks (partnership with Lee County)

2.3 Recommendations for public side streets (shown in yellow)

2.4 Not in scope:
- Times Square area
- San Carlos Blvd (FDOT owned)
- Private side streets (shown in purple), e.g.:
  - Bay Beach Dr
  - Bay Village Dr.
  - Widgeon Ter.
  - Sand Dollar
  - Sunset Cir.



Provide Feedback to 480-364-5123 – suzanne@townlighting.com *Page 1 of 8*

TOWN OF FORT MYERS BEACH
ESTERO BOULEVARD LIGHTING PROJECT
ADVISORY COMMITTEE OUTREACH

3. Light Level Considerations

3.1 Lighting Level

Estero Boulevard is minor arterial along most of the island. Here is the light level standard for minor arterials:

Lighting Levels:

E_{AVG} = 1.0 fc or 11 Lux

L_{AVG} = 0.9 CD/M²

Topic # 625-000-015 April 2016
Manual of Uniform Minimum Standards
for Design, Construction and Maintenance
for Streets and Highways

TABLE 6 – 1 Level of Illumination for Streets and Highways

Roadway and Walkway Classification	Off-Roadway Light Sources	Illuminance Method					Luminance Method			Additional Values (both Methods)
		Average Maintained Illuminance (Horizontal)				Illuminance Uniformity Ratio	Average Maintained Luminance			Veiling Luminance Ratio
		R1	R2	R3	R4		Lavg	Uniformity		
	General Land Use	(foot-candles) (min)	(foot-candles) (min)	(foot-candles) (min)	(foot-candles) (min)	avg/min (max) (i)	cd/m2 (min)	Lavg/Lmin (max)	Lmax/Lmin (max)	Lv(max)/Lavg (max)[1]
Principal Arterials (partial or no control of access)	Commercial	1.1	1.6	1.6	1.4	3:1	1.2	3:1	5:1	0.3:1
	Intermediate	0.8	1.2	1.2	1.0	3:1	0.9	3:1	5:1	0.3:1
	Residential	0.6	0.8	0.8	0.8	3:1	0.6	3.5:1	6:1	0.3:1
Minor Arterials	Commercial	0.9	1.4	1.4	1.0	4:1	1.2	3:1	5:1	0.3:1
	Intermediate	0.8	1.0	1.0	0.9	4:1	0.9	3:1	5:1	0.3:1
	Residential	0.6	0.7	0.7	0.7	4:1	0.6	3.5:1	6:1	0.3:1
Collectors	Commercial	0.8	1.1	1.1	0.9	4:1	0.8	3:1	5:1	0.4:1
	Intermediate	0.6	0.8	0.8	0.8	4:1	0.6	3.5:1	6:1	0.4:1
	Residential	0.4	0.6	0.6	0.5	4:1	0.4	4:1	8:1	0.4:1
Local	Commercial	0.6	0.8	0.8	0.8	6:1	0.6	6:1	10:1	0.4:1
	Intermediate	0.5	0.7	0.7	0.6	6:1	0.5	6:1	10:1	0.4:1
	Residential	0.3	0.4	0.4	0.4	6:1	0.3	6:1	10:1	0.4:1
Alleys	Commercial	0.4	0.6	0.6	0.5	6:1	0.4	6:1	10:1	0.4:1
	Intermediate	0.3	0.4	0.4	0.4	6:1	0.3	6:1	10:1	0.4:1
	Residential	0.2	0.3	0.3	0.3	6:1	0.2	6:1	10:1	0.4:1

Continued on next page

Lighting 6-7

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TOWN OF FORT MYERS BEACH
ESTERO BOULEVARD LIGHTING PROJECT
ADVISORY COMMITTEE OUTREACH

4. Light Color Considerations

4.1 In areas visible to the beach during nesting season, amber color lights will be required.

4.2 Higher color temperature means more skyglow, which could distract turtles.

4.3 Higher color temperature means better visibility, which could reduce crashes.

4.4 Higher color temperature means better energy efficiency. Here is an example of comparative energy costs between HPS, 4000K LED, and amber LEDs. Each row in the example delivers roughly the same amount of lighting for a length of roadway similar to Estero Boulevard.

Luminaire	Source	Lumen Output	Power W	Qty.	Total Power W	KW	kWh for 11h/day	kWh for 365 days	Annual Energy Cost	Energy Cost Difference
Cooper OVY Series	200W HPS	17,000	240	175	42,000	42.0	462.0	168,630	$16,863	Similar to today
eLuminaire 4000K	LED	17,000	146	140	20,440	20.4	224.8	82,067	$8,207	49% (less)
eLuminaire Amber	Amber LED	16,500	470	140	65,800	65.8	723.8	264,187	$26,419	157% (more)
Cree-RSW-AMBER	Amber LED	5,300	144	561	80,830	80.8	889.1	324,533	$32,453	192% (more)

TOWN OF FORT MYERS BEACH
ESTERO BOULEVARD LIGHTING PROJECT
ADVISORY COMMITTEE OUTREACH

4.5 EXERCISE

Different light colors have certain advantages / disadvantages for human safety and effects on turtles. Share your thoughts on this. Assign a priority of 1 – 10, with 1 being most important.

Light Color	Pros / Cons	How Important Is This in Turtle Season?	How Important Is This outside Turtle Season?
4000K	Increased skyglow		
	Increased chance of turtle disorientation		
	Best color rendition for • Sense of Security • First Responders • Tourism		
	Best visibility of pedestrians / decreased chance of accidents		
	Least Energy Use ~120 Lumens per Watt Efficacy		
2700K - 3000K (2700K is low availa-bility)	Existing side street light color		
	Increased skyglow, possibly less than 4000K		
	Increased chance of turtle disorientation, possibly less than 4000K		

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TOWN OF FORT MYERS BEACH
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ADVISORY COMMITTEE OUTREACH

Light Color	Pros / Cons	How Important Is This in Turtle Season?	How Important Is This outside Turtle Season?
	Good color rendition, but less than 4000K for: • Sense of Security • First Responders • Tourism		
	Good visibility of pedestrians, not as good as 4000K		
	Energy Use Comparable to 4000K, about 5% worse.		
Turtle-Friendly Amber	Very little skyglow		
	Little chance of turtle disorientation		
	Poor color rendition for: • Sense of Security • First Responders Tourism		
	Decreased visibility of pedestrians / increased chance of accidents •		
	Worst Energy Efficiency ~36 Lumens per Watt Efficacy Significant additional capital costs		

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TOWN OF FORT MYERS BEACH
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Light Color	Pros / Cons	How Important Is This in Turtle Season?	How Important Is This outside Turtle Season?
How does the importance of the above considerations differ between Estero Boulevard and side streets?			
Other Light Color / Level / Quality Considerations			

5. Lighting Design Extents

5.1 An Estero Boulevard safety risk is pedestrians suddenly walking into the street at crosswalks and non-crosswalk locations. Lighting for areas surrounding the roadway can improve driver visibility of pedestrians, providing longer detection distance and reducing the chance of accidents.

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TOWN OF FORT MYERS BEACH
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ADVISORY COMMITTEE OUTREACH

5.2 EXERCISE

Share your thoughts about the extents of lighting. Assign a priority of 1 – 10, with 1 being most important.

Lighting Design	Pros / Cons	How Important Is This for Estero Blvd?	How Important Is This for Side Streets?
Roadway Only	• Lowest Cost • Least Lighting • Least Pedestrian Visibility		
Roadway + Sidewalks	• Medium Cost • More Lighting than Roadway Only • Better Pedestrian Visibility		
Roadway + Sidewalks + Surrounds, Not Buildings	• Highest Cost • Most Lighting • Greatest Pedestrian Visibility • Possible Property Security Benefit		

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TOWN OF FORT MYERS BEACH
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ADVISORY COMMITTEE OUTREACH

Lighting Design	Pros / Cons	How Important Is This for Estero Blvd?	How Important Is This for Side Streets?
Other Design Extents Considerations			
Other Overall Considerations			

Provide Feedback to 480-364-5123 – suzanne@townlighting.com *Page 8 of 8*

Public Safety Committee feedback/recommendations for Lighting Consultant:

Street lighting requirements and concerns as determined by the Public Safety Advisory Committee.

The Public Safety Committee was established by Town of Fort Myers Beach ordinance 18-06, Establishment of Boards, with the following directive:

(g) Public Safety Committee. The PSC shall address any safety and transportation issues specifically assigned to the committee by the Town Council for the purpose of the health, safety and welfare of the citizens and visitors to the Town of Fort Myers Beach. The committee shall review, discuss and evaluate the most significant safety and transportation issues within the Town. The PSC shall advise the Town Council on these matters or any other topics as assigned by the Town Council.

Therefore, the Committee took the approach of determining street lighting requirements which best protect the pedestrians, cyclists and vehicle operators on the island. We recognize that mandates exist for protection of island wildlife, with special attention to turtles and disorientations. However, that is not part of the Public Safety Committee's direction from the Council. It is our expectation that you will consider these requirements and concerns regarding pedestrian, cyclist and vehicle operators and factually present and position them to the Council equally with the requirements needed to be in compliance with FWC regulations.

Each committee member attempted to complete the survey provided to us, however it did not allow the committee to accurately document our requirements. Further it was asking very specific questions regarding various lighting intensity and color solutions. The committee felt it was not competent to answer those questions, we expect you will review our requests/recommendations and provide the facts as to how each of these viable lighting options is impacted by the various scenarios.

Survey Feedback:

- ⇒ Page 4 of 8 ····We recommend light uniformity along the entire length of Estero Boulevard. The light solution must be consistent for the entire year (both in turtle season and out of turtle season). Whatever solution is recommended to the Council should ensure the best possible alternative for pedestrian, cyclist and vehicle operators and should not be reduced during turtle season. The end result of reducing the lighting efficiency during specific periods would basically be saying that human safety is less of a priority at various times of the year. The Public Safety Committee believes that is an unacceptable position.
  - ⇒ Side street and beach access lighting — there needs to be a "uniform" transition between side street and beach access lighting and the solution proposed for Estero Boulevard. It is our understanding that lighting uniformity is the key to reducing the negative impact of "eye confusion" on visibility. At no time should the solution be to turn off lights or reduce the lights during specific times of the year. (see above)
- ⇒ Page 5 of 8 ·····Conflicting studies to those you presented have been raised by the Stakeholders group on the effect of lighting for emergency responders. The Committee doesn't question the validity of these studies but they seem to represent differing population density and possibly differing operating models for emergency responders. We therefore, request that you interview representatives from the Fort Myers Beach Fire Department and the Lee County Sheriff's Office to determine their operating procedures to assess if/how the lighting solution that is recommended will have an impact on our local emergency response units.

- You ask a question of decreasing visibility – it is impossible to answer that question without the metrics and impact of how much the recommended solution options decrease visibility and what the impact would be on public safety. Therefore, when you are making your recommendations to the Council, we ask that you document the degree of impact the decrease has in life situation metrics. For example, time for vehicle operator to respond when seeing a pedestrian, distance at which a pedestrian or cyclist is visible. Percentages really wouldn't be an effective way to assess the impact.

- Page 7 of 8 The Committee recommends that the street light coverage include both street and sidewalk. Since the streetlights are physically on the gulf side of the Boulevard, we would like further explanation of how any proposed solution will light the sidewalk on the Bay side of the Boulevard. Will there need to be additional poles installed on the Bay side? In addition to the more obvious need to have visibility to pedestrians stepping off the sidewalk onto the street there is also the problem of cyclists riding on the sidewalks in conflict with pedestrians. Without adequate lighting on both sidewalks the clash of these two sidewalk users is a risk to public safety.

Other Recommendations and Concerns:

- Solution must conform to the laws of the State of Florida, Lee County and Town of Fort Myers Beach.
- The solution must be fiscally viable beyond initial implementation. The costs of future maintenance must be reasonable as to ensure that funding will never create a situation where street lighting is not operating as designed, thereby creating lighting gaps and increasing the risk to the public.
- The lighting product(s) that are recommended must allow for sufficient inventories to address timely replacement or rebuilding of any damaged fixtures in the event of a disaster or other event that causes lighting outages.

Crosswalks are not part of your scope within the current RFP. This is a very big concern for the committee. It is our understanding that to optimize lighting at crosswalks requires coordination of street lighting, crosswalk specific lighting and surrounding area lighting. We further understand that the County has indicated that they will design the crosswalk lighting after the Council selects the street lighting solution. While the County is a great partner this sequencing may have the following effect 1) the solution selected by the Council may constrain the crosswalk solutions available to the County and therefore not provide optimal light solutions at these critical pedestrian / vehicle touchpoints or worse have a deteriorating effect on the solution selected by the Council 2) Waiting to design the crosswalks until after the street lighting solution is selected by the Council will further delay providing a lighting solution at these critical intersections of pedestrians and vehicles 3) With the County designing the crosswalk solution the Town will have less input into that design than if crosswalks were included in this initial recommendation by the Town's consultant i.e. Town Lighting.

The number of additional poles that may be added in your recommended solution – the placement of these poles may interfere with the visibility of vehicle operators as they exit personal or commercial accesses/drives. Pedestrians and cyclists may be hidden in a blind spot created by additional poles.

We too would like to have you demonstrate what solutions other like communities have implemented, both narrative description with documented results as well and visuals.

Finally, if the solution you propose requires compromise to the optimal solutions available to provide the greatest protections to pedestrians, cyclist and vehicle operators we request that you detail where those compromises were made and the impact of those compromises. Again, using situational metrics not percentages or degrees to quantify the impact.

Estero Blvd Lighting Project—Recommendations

MRTF Advisory Board—Our Purpose & Scope

"The broad objective of the MRTF is to further the welfare of the citizens of the town by helping to promote a better, more healthful, safe and attractive community environment and to ensure that the unique and natural characteristics of our marine resources are present."

Project Purpose:

-To identify all major aspects involved in the Estero Blvd Lighting Project, discuss the relative impact to our community, and draft our project recommendations for the lighting design firm Town Lighting, our Town Council, and the residents of our community.

MRTF Findings:

-The installation of 3K white LED street lighting installed in 2019 on our side streets and beach accesses proved to not comply as wildlife friendly lighting and now results in over 30 of these new roadway fixtures being turned off during turtle season. Immediately following this project, the County Metropolitan Planning Organization was enlisted to provide a lighting design plan for Estero Blvd. When presented, this plan included the installation of 4K white LED street lighting throughout the Blvd. Our previously seated Council voted three times to reject the 4K white LED plan voting 3-1, 4-1, 4-1.

-The Town of Fort Myers Beach environment continues to be assaulted with water pollution impairment problems, airline noise pollution disturbance, continued residential/commercial development and increased density. Conservation of what remains is of the utmost importance to our community and it's future.

-Artificial lighting, albeit a help to society, is also a source of light pollution affecting our environment. Artificial lighting at night has a direct impact on our entire ecology, including human health, biodiversity and quality of our night skies. White LED lighting, currently absent on Estero Blvd, emits blue-rich white light that further exasperates the affects of artificial lighting on our natural environment.

-Sky glow, as well as other forms of light pollution can be attenuated using Dark Skies principles. The MRTF is investigating the process of becoming a Dark Skies community, which the use of narrow band amber (NBA) LED street lighting would become the backbone of compliance.

-Safe roadway lighting is incumbent on providing a uniform corridor of illumination. As such, each Estero Blvd lighting recommendation will include an increase of light illumination in order to meet uniform lighting requirements. We find that choosing NBA LED street lighting will offset this increase in light pollution due to it's long wavelength spectral power distribution while conserving the closest color match to our current HPS street lighting.

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Estero Blvd Lighting Project—Recommendations

MRTF Findings:

-All three current traffic signal projects on FMB incorporate full year, NBA LED lighting due to wildlife sensitive lighting concerns. Lynn Hall Park and Bowditch Point Park are also lit with NBA LED lighting. Harmonizing street lighting and light color will improve visual acuity while contributing to the overall consistency of our community appearance.

-We have examined the current case study of Treasure Island, FL in Pinellas County and consider it to be a parallel experience to what our community is facing. Their coastal street lighting design solution is comprised of safe, FDOT & FWC approved NBA LED street lighting, and should be used as a benchmark when considering street lighting design for Estero Blvd.

-Town Lighting stated in the MRTF presentation that they could proceed today with a full NBA LED solution, similar to that which was adopted by the County signal plan lighting.

-The FPL Director of LED Lighting Solutions presented information to Town Council regarding cost information involving retrofit projects using NBA LED street lighting that minimize costs to the Town through tariff programs.

-The use of wildlife friendly lighting, while minimizing blue-rich white light will preserve the ecological biodiversity of our community and reinforce the eco-tourism branding of our island community.

The Marine Resource Task Force submits the following unanimous recommendations for the Estero Blvd lighting project:

I. MRTF advises the FMB Council to choose NBA LED streetlights for year around use on Estero Blvd and on the Town side streets.

II. MRTF advises the FMB Council to comply with Dark Sky lighting principles.

III. MRTF recommends center line to sidewalk for Estero Blvd lighting design.

IV. MRTF recommends the enhancement of pedestrian safety at crosswalks utilizing additional on-demand technology while adhering to Dark Sky guidelines and sea turtle lighting ordinances.

Marine Resource Task Force Advisory Board – 28 May 2021

Wendy DeGaetano	Rose Larkin	Mary Rose Spalleta
Rob Howell	Jennifer Rusk	Greg Fossum, Vice Chair
	Steve Johnson, Chair	

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