Lighting Policy and Framework

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Introduction

The *Lighting Policy and Framework* identifies and provides a conceptual hierarchy for illuminated components within the monumental core and surrounding federal areas within the capital city. It builds on current polices, historic principles, and the Urban Design Streetscape Framework. It also integrates existing conditions and planned street lighting improvements into a comprehensive lighting framework. To coordinate with the City's Smart Street Light Project, the *Lighting Policy and Framework* addresses street lighting with greater specificity by providing more detail and technical guidance.

The *Lighting Policy and Framework* provides context and principles for more detailed planning and technical guidance that will inform development of the Streetscape Guidelines and updates to the Streetscape Construction Manual including LED Streetlight Specifications, which will be developed in future work tasks.

This document addresses lighting for several components of the public realm within the monumental core, and is organized as follows:

- **Structures**: Civic Buildings, Monuments, Memorials, and Bridges
- **Landscapes**: Parks and Open Spaces
- **Streetscapes**: Avenues and Streets

Lighting principles and guidance are provided for each component within their respective sections.

Purpose:

The purpose of the Lighting Policy and Framework is to provide general guidance for lighting within downtown areas of the monumental core in support of policies that state the federal government should:

> *Utilize building, street, and exterior lighting that* ***respects the hierarchy of memorials, monuments, and important civic buildings and spaces*** *in the nation's capital, with* ***the U.S. Capitol and Washington Monument the most prominent features in the nighttime skyline****.*
>
> *(Urban Design Element, 2016)*

The Lighting Policy and Framework focuses on enhancing the character of areas with greatest national interest within the monumental core and clarifying the role street lighting plays in supporting visual connections to nationally significant destinations. The Lighting Policy and Framework builds on current policies; provides guidance on the hierarchy of nationally significant civic buildings, memorials, monuments, bridges, parks, and open spaces; and provides detailed guidance on street lighting to coordinate guidance with the city's new Smart Street Lighting project. Coordinating guidance for streets within downtown areas of the monumental core is particularly important since the District Department of Transportation's (DDOT) Streetlight Policy and Design Standards (2013) exempts the areas in and around the National Mall.

Goals:

Building upon the Lighting Policy and Framework's purpose to advance implementation of the Urban Design Element, the goals of the Lighting Policy and Framework are to:

- **Create a clear lighting hierarchy** that respects and protects the symbolic meaning and nighttime appearance of iconic structures, open spaces, and streets within the monumental core.

- **Build upon the capital city's historic lighting plans** by carrying forward important principles**.**

- **Recognize the nighttime appearance of the existing urban context** that surrounds the monumental core.

- **Address contemporary street lighting issues**, such as changing technologies and capabilities.

Background and Context:

City lighting is important because it fulfills a range of aesthetic and mobility needs. Streetscape and architectural lighting illuminate the city at night, provides visual access, improve safety and security, offer visual comfort, and enhance the character and spatial experience of the urban environment.

Lighting design has a long planning history in the capital city covering a range of subjects, including lighting for distinct purposes, the type and placement of light poles, and the color and type of light emitted. Over time, the primary emphasis of street lighting has gone from pedestrian comfort and safety, to the convenience of the motorist, to crime prevention, and has now become more comprehensive to address all needs. As needs have evolved, Washington's streetlight fixtures (Washington Globes and Twin-Twenties), as originally designed in 1910 and 1923, have stood the test of time; the cast iron pole design is still in use. Vehicle speeds have increased along with demands for higher illumination to compensate for the glare of headlamps and the need to make traffic decisions quickly. Higher wattage incandescent lamps were followed by more efficacious mercury lamps (with their distressing blue-green cast) and most recently by high pressure sodium lamps (with their distorted yellow-orange color and intolerable glare).

Modernization programs to reduce energy usage and cut costs, like the City's Smart Lighting Project and public-private partnership, introduce new challenges. Creating LED streetlight fixtures with warmer light tones (warmer color temperature) similar to incandescent and high-pressure sodium lamps, is technically challenging and expensive. The heavy glass globes, difficult to maintain and costly to purchase, have been replaced with high impact plastic, which tends to yellow over time and effect light quality.

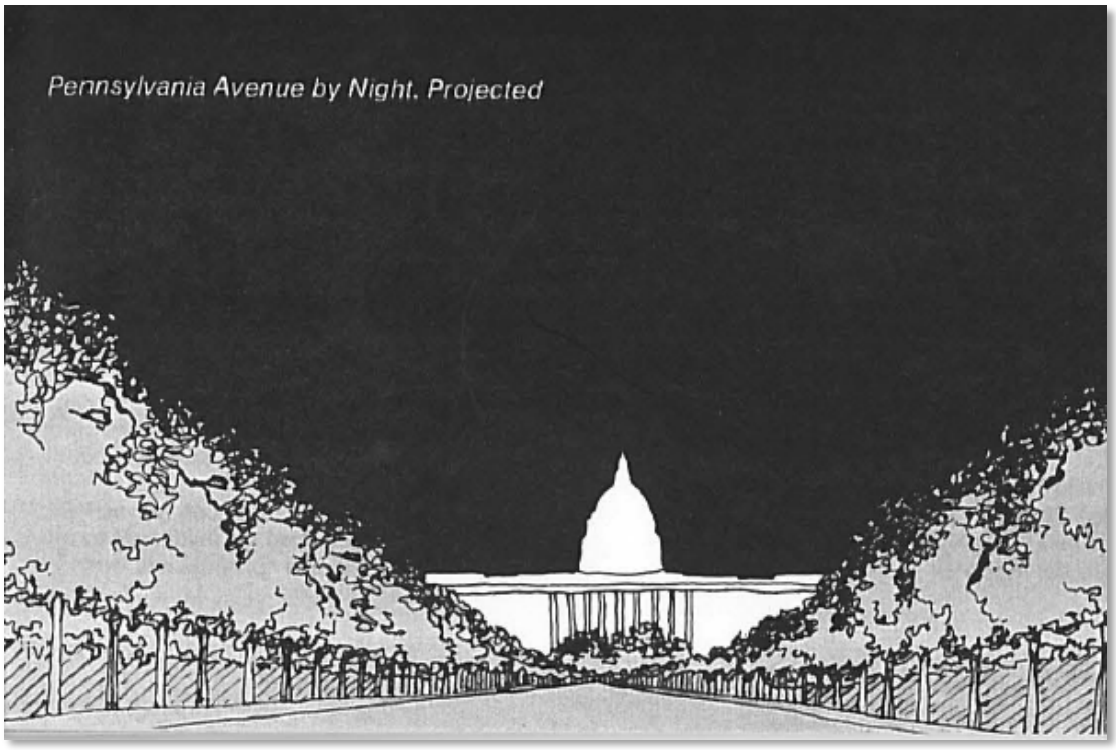
New technologies and practices are changing the design, installation, and management of lighting in the city, affecting the long-standing lighting principles established by history and preceding plans. These changes require re-assessing lighting goals and re-visiting historical street lighting aesthetics and principles.

Principles Carried Forward from Historic Lighting Plans:

To balance current modernization programs and changing technologies with the capital city's lighting legacy, it is important to carry forward the following principles from historic lighting plans:

- **Lighting should differentiate areas of national significance** (within the monumental core and radial avenues and streets) from surrounding city lighting. Historically, the monumental core had a soft white (color temperature) lighting, while the surrounding urban and residential areas had yellow to orange (color temperature) street lighting.

- **Street and building lighting should enhance views and vistas to illuminated iconic structures.** Streets with visual termini on nationally significant illuminated structures should calibrate architectural and street lighting brightness to enhance the illuminated terminus, rather than focus on the adjacent buildings or streetlights.



Contextual Considerations:

It is important to consider the urban context and relationships of monumental core lighting to city lighting and land use policies, and existing conditions, such as residential areas and Designated Entertainment Areas (DEAs) when considering architectural and streetscape illumination. The Lighting Policy and Framework may need to adapt to accommodate these areas.

The city currently has several illuminated structures whose entertainment uses draw large crowds. Entertainment uses often use brighter architectural and sign illumination for outdoor visibility, wayfinding, and amusement. For example, the Nationals Stadium uses brighter outdoor, architectural, and sign illumination for outdoor baseball games and entertainment-related signage. The Capital One Arena uses brighter architectural and sign illumination to draw crowds to its location within the Chinatown neighborhood. The Anthem concert hall at the Wharf also maintains brighter signage to advertise its music programming.

The following map illustrates the city's Designated Entertainment Areas according to District Zoning Regulations (Chapter 9). These include: The Gallery Place Project, The Verizon Center (now the Capital One Arena), The Ballpark Area, and the SW Waterfront and Fish Market.

Lighting Policy and Framework

Lighting Policy and Framework

Conceptual Approach and Organization:

Components within the public realm are subdivided into tiers. The tiers help to distinguish the symbolic meaning, significance, and visual prominence of iconic structures and streets within the city's urban design framework. Components are further sub-categorized by their settings. The settings consider the lighting needs of the surrounding environment. General lighting guidance and principles are provided for each tier. While the tiers define a hierarchy of significance and nighttime appearance, the tiers are not intended to indicate relative brightness (or luminance) or provide specific guidance or details on how to implement building, bridge, park, or open space illumination. Specific strategies and techniques to illuminate individual civic buildings, monuments, memorials, bridges, or parks and open spaces are outside of the scope of this document and would be determined by their respective property owners and operators in consideration of the policies and objectives established within this document.

To establish a nighttime illumination hierarchy, Washington's important structures and landscapes are organized into tiers using the following criteria.

Tier 1 Criteria:

- Nationally significant symbolic meaning.
- Critical to the national capital nighttime image and identity.
- Visually prominent components that have relationships to other sites and open spaces beyond their immediate surroundings.
- Located on a major axis or entry point.
- Identified in policies or historic plans.

Tier 2 Criteria:

- National or local symbolic meaning.
- Important to the city's nighttime image and identity.
- Visually prominent components that have relationships to other sites and open spaces beyond their immediate surroundings.

Tier 3 Criteria:

- National or local importance.
- Civic uses.
- Either symbolic meaning or visual prominence in the city's nighttime image.

Structures, Landscapes, and Streetscapes are sub-categorized according to their settings. The settings include the following:

Nationally Significant Open Space: located within or edging the National Mall and Architect of the Capitol Grounds.

Urban: located in federal workforce, commercial, mixed-use, cultural, or institutional areas.

Residential: located in residential neighborhoods.

Natural/Waterfront: located within large parks or gardens, or edging riverfronts, channels, or basins.


Structures
LEGEND
Structures
Tier 1
Tier 2
Tier 3
Structures

Structure Tiers: Civic Buildings, Monuments, Memorials, and Bridges:

Federal policies support the preeminence of the Washington Monument and US Capitol building in Washington's nighttime skyline. These structures are most visually prominent because of both their location, scale, height and architectural lighting. However, other civic buildings, monuments, and memorials such as the White House, Jefferson and Lincoln memorials are also important to Washington's nighttime cityscape. The capital city's civic buildings, monuments, memorials, and bridges are in a variety of settings, including nationally significant open space, urban, residential, and natural/waterfront areas. These settings establish the context and surroundings within which the structure is viewed and accessed.

The nation's important civic buildings, monuments, memorials, and bridges, are tiered according to their national significance and spatial prominence within the city's framework and are sub-categorized by their settings as follows:

Tier 1:

Nationally Significant Open Space Setting: US Capitol, Washington Monument, White House, Lincoln Memorial, and Jefferson Memorial.

Urban Settings: US Supreme Court.

Natural/Waterfront Settings: Kennedy Center.

Tier 2:

Nationally Significant Open Space Setting: US Treasury, Eisenhower Executive Office Building, and WWII Memorial.

Urban Settings: Library of Congress (Jefferson Building), Union Station, Old Court House, Archives, Portrait Gallery, Carnegie Library, and City Hall.

Natural/Waterfront Settings: Arlington House, Iwo Jima Memorial, Tomb of the Unknown Soldier, Air Force Memorial, and Arlington Memorial Bridge.

Residential Settings: National Cathedral and Basilica of the National Shrine of Immaculate Conception.

Tier 3:

Nationally Significant Open Space Setting: Smithsonian Castle and museums, National Gallery of Art, Whitten Building (Dept. of Agriculture), US Botanic Garden, Vietnam Veterans Memorial, Korean War Veterans Memorial, DC War Memorial, MLK Memorial, FDR Memorial, and George Mason Memorial.

Urban Settings: Federal Triangle (and Old Post Office Tower), National Building Museum, Court buildings within Judiciary Square, Adams Building, Madison Building, House and Senate Office Buildings (Cannon, Dirksen, Hart, Longworth, Rayburn, Russell), Folger Shakespeare Library, Veterans Disabled for Life Memorial, Eisenhower Memorial, Ford's Theatre, Belmont-Paul Women's Equality National Monument, NW Rectangle buildings along the National Mall and President's Park (Organization of American States, Octagon House, Red Cross, Daughters of the American Revolution / Constitution Hall, Corcoran School), US Institute of Peace, Latrobe

Gate to Navy Yard, and Pentagon (and Memorial).

Natural/Waterfront Settings: Women in Military Service for America Memorial, National War College, Netherlands Carillion, Francis Scott Key Bridge, and Frederick Douglas Memorial Bridge.

Residential Settings: Frederick Douglas House and St. Elizabeths.

Structures Lighting Principles:

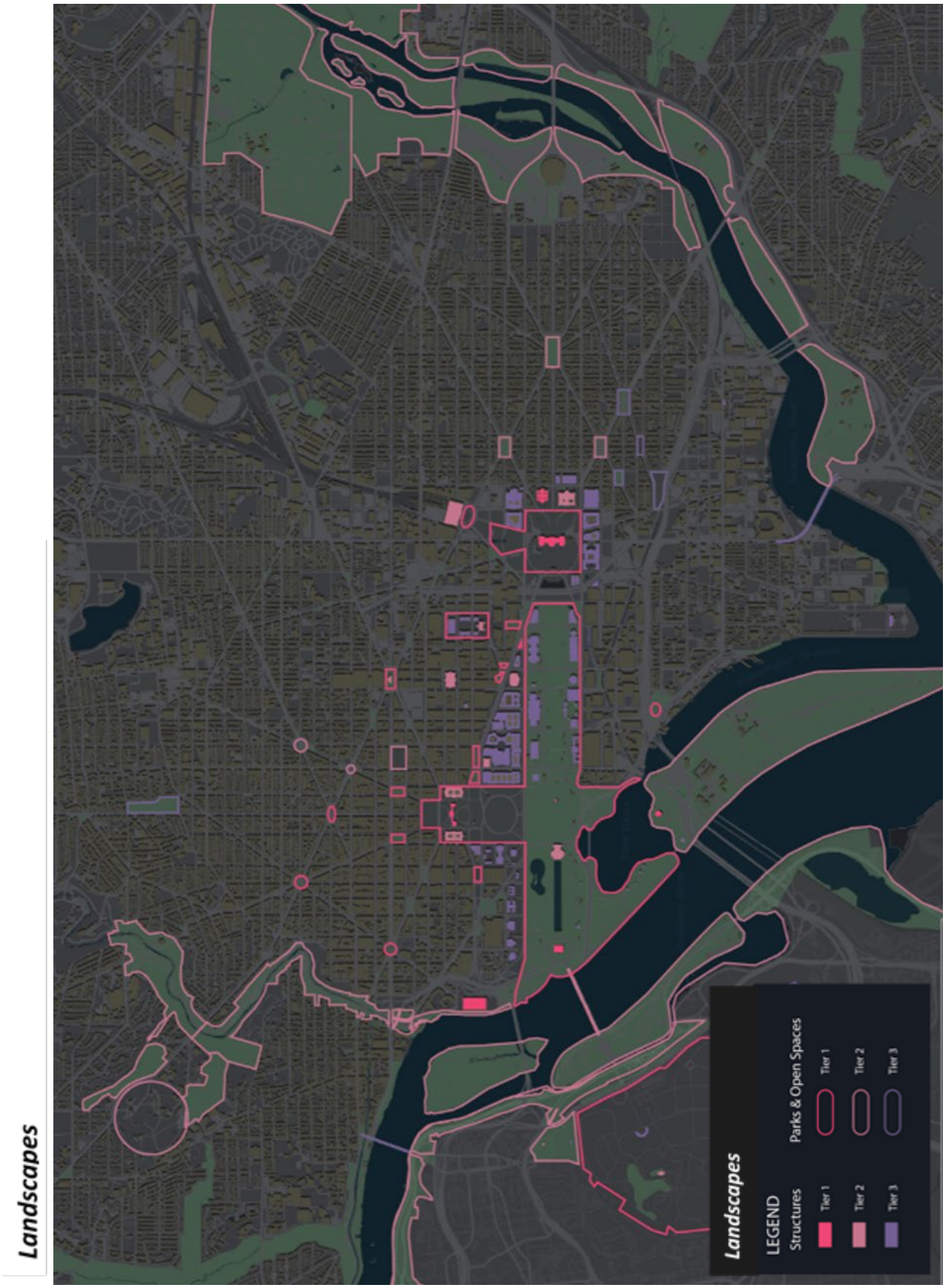
This guidance addresses the nighttime appearance of civic icons within the capital city.

1. **Nighttime appearances should convey symbolic meaning:** Within this area, civic building, monument, memorial, and bridge lighting should provide a nighttime experience that reflects their symbolic and ceremonial meaning and role.
2. **The capital city should have a clear lighting hierarchy:** Civic building, monument, memorial, and bridge lighting should have a legible illumination hierarchy – as defined by the tiers - which elevates preeminent nationally significant (Tier 1) structures in the night sky.
3. **Architectural lighting should enhance structures:** Lighting of civic buildings, monuments, memorials, and bridges shall be designed to reveal and emphasize symbolism and architectural detailing, as well as ensure readability of any quotations or inscriptions at night.
4. **Protect the night sky:** Lighting of civic buildings, monuments, memorials, and bridges should prioritize down-lighting and limit up-lighting to protect the night sky.
5. **White light is important to the city's identity and harmony among civic buildings, monuments, memorials, and bridges:** White light reinforces a timeless image and celebrate the civic character of the capital city. (See Attachment 1: White Light Policy)

Specific technical guidance for architectural illumination is outside the scope of this document. Civic building, monument, memorial, or bridge owners and architectural lighting designers can use a variety of techniques to feature or express the symbolic meaning and showcase architectural features or details. Various techniques include:

- Down-lighting
- Up-lighting
- Interior illumination (from translucent materials)
- Facade illumination (for inscriptions or bas relief panels)

Civic building, monument, memorial, or bridge owners and lighting designers should balance architectural lighting for aesthetic purposes with other considerations including security, operations and programming, deliveries, or maintenance as well as the structure's composition relative to important structures, settings, and open spaces.


Landscapes
LEGEND
Structures
Tier 1
Tier 2
Tier 3
Parks & Open Spaces
Tier 1
Tier 2
Tier 3
Landscapes

Landscape Tiers: Parks and Open Spaces:

The city's L'Enfant Plan establishes a network of parks and open spaces critical to the pedestrian experience that connect between civic and neighborhood destinations. The National Mall is an iconic civic destination and open space at the core of the capital city. The circles and squares, such as Columbus Circle and Farragut Square highlight the L'Enfant City structure including important relationships between the three branches of government and the capital city's neighborhood parks and open spaces, such as Logan Circle and Eastern Market Park. The capital city's parks and open spaces are in a variety of settings, including nationally significant open space, urban, residential, and natural areas. These settings have different sensitivities to streetlight brightness.

The nation's important parks and open spaces are tiered according to their national significance and spatial prominence within the city's framework. The parks and open spaces are also sub-categorized by their settings as follows:

Tier 1:

Nationally Significant Open Space Setting: National Mall including The Mall, Washington Monument Grounds, and West Potomac Park; President's Park including The White House, Ellipse, and Lafayette Park; and PADC parks including Pershing Park, Freedom Plaza, Market Square, Indiana Plaza, Mellon Fountain, and Marshall Park.

Urban Settings: Capitol Square, Senate Parks, Columbus Circle, Judiciary Square, Mt. Vernon Square, Farragut Square, McPherson Square, Scott Circle, Washington Circle, DuPont Circle, Banneker Park, and Rawlins Park.

Natural/Waterfront Settings: Arlington National Cemetery.

Tier 2:

Urban Settings: Thomas Circle and Franklin Square.

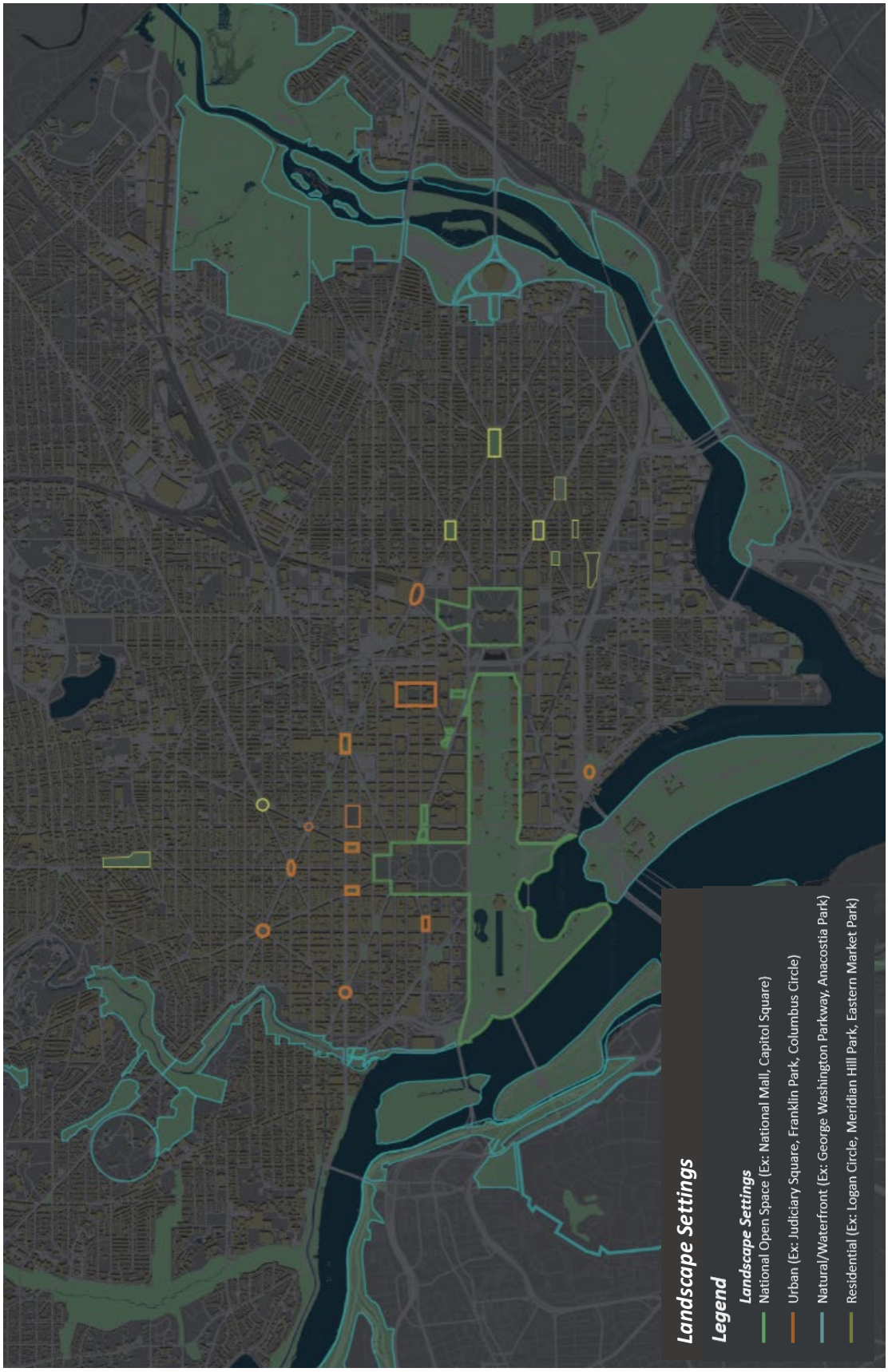
Natural/Waterfront Settings: East Potomac Park, George Washington Memorial Parkway (including Columbia Island, Arlington Ridge Park, and Theodore Roosevelt Island), Rock Creek Park, National Arboretum, Anacostia Park, Kenilworth Park and Aquatic Gardens, and Potomac and Anacostia waterfronts.

Residential Settings: Logan Circle, Stanton Park, Lincoln Park, and Seward Square.

Tier 3:

Residential Settings: Eastern Market Park, Folger Park, Marion Park, Garfield Park, and Meridian Hill Park.

Landscape Settings



Landscape Lighting Principles:

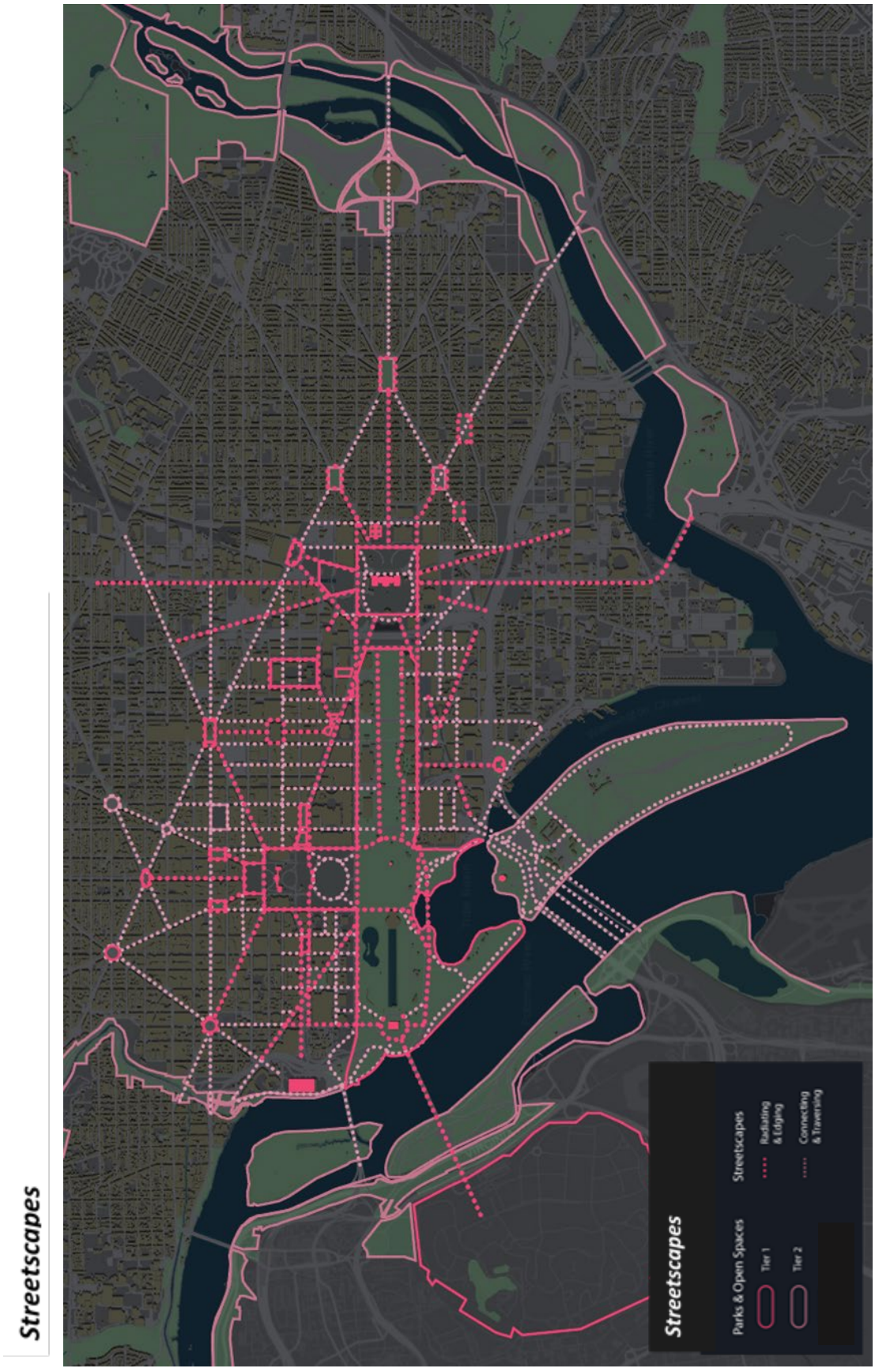
This guidance addresses street lighting edging the perimeter or traversing through parks and open spaces. This guidance does not address the lighting within or internal to parks and open spaces. Streetlight brightness depends on the setting, land use context, and pedestrian use of each park or open space.

1. **National Mall lighting should accentuate iconic civic structures:** Street lighting through and around the National Mall (nationally significant open space setting) should have a soft or warm white light and low ambient light levels to support a dark backdrop for highlighted civic buildings, monuments, and memorials.
2. **Perimeter park and open space lighting should highlight the L'Enfant Plan:** Street lighting along the perimeter of significant L'Enfant Plan circles, squares, parks, or open spaces should provide visual continuity through a soft or warm white light color temperature and consistent brightness, depending upon the location and setting.[1]
3. **Urban areas should be brighter:** Street lighting adjacent to parks in urban and commercial areas may have higher ambient light levels to meet pedestrian visibility, safety, and security demands.
4. **Natural, waterfront, and residential areas should be dimmer:** Street lighting adjacent to parks in naturalized areas and waterfronts such as East Potomac Park, should have low ambient light levels to shield habitats, aquatic life, and protect the night sky.

Specific technical guidance for park illumination within or internal to parks and open space is outside the scope of this document. Park owners and operators can use a variety of techniques to feature or express the symbolic meaning and showcase park features or details.

- Path lighting
- Site lighting
- Spotlighting
- Underwater lighting

[1] This principle is compatible with the 1992 CFA Conceptual Lighting Plan.


Streetscapes
Streetscapes
Parks & Open Spaces
Tier 1
Tier 2
Streetscapes
Radiating & Edging
Connecting & Traversing

Streetscapes: Avenues and Streets

The streetscape lighting hierarchy is defined by each avenue or street's symbolic and visual connections, surrounding context and settings, and application of streetlight fixtures. Special streets within the capital city are organized into three categories that correspond with the *Urban Design Streetscape Framework*. The capital city's avenues and streets are in a variety of settings, including nationally significant open space, urban, residential, and natural/waterfront areas. These setting have different sensitivities to streetlight brightness.

The nation's important avenues and streets are categorized according to their national significance and spatial prominence within the city's framework. The avenues and streets are also sub-categorized by their settings as follows:

Streetscape Lighting Categories include:

Radiating and Edging Streets:

These streets are important because of their unique symbolic role and spatial alignment providing a reciprocal, radial, or edging visual frame between nationally significant structures or open spaces (see Vista and Viewshed map). These streets generally have Twin-Twenty fixtures and are generally located in either nationally significant open space settings, urban, or federal workforce settings and include for example**:**

Nationally Significant Open Space Setting (examples):

Independence Avenue SW
Constitution Avenue NW
15th Street NW
17th Street NW

Urban Settings (examples):

Pennsylvania Avenue NW [2]
16th Streets NW
Virginia Avenue NW
New York Avenue NW
North and South Capitol Streets
Portions of East Capitol Street
Independence Avenue SE
Constitution Avenue NE

[2] More information regarding Pennsylvania Avenue lighting can be found in the 1977 and 1987 PADC Lighting Plans.

Connecting and Traversing Streets:

These streets are important to highlight because of their physical linkages to or among nationally significant structures or open spaces. Connecting and traversing streets generally have Washington Globe fixtures and are located in a variety of urban, residential, and natural settings and include for example:

Urban Settings (examples):

Massachusetts Avenue NW
K and F Streets NW
7th Street NW and SW
Rhode Island Avenue NW

Residential Settings (examples):

Massachusetts Avenue NE
North Carolina Avenue SE

Natural/Waterfront Settings (examples):

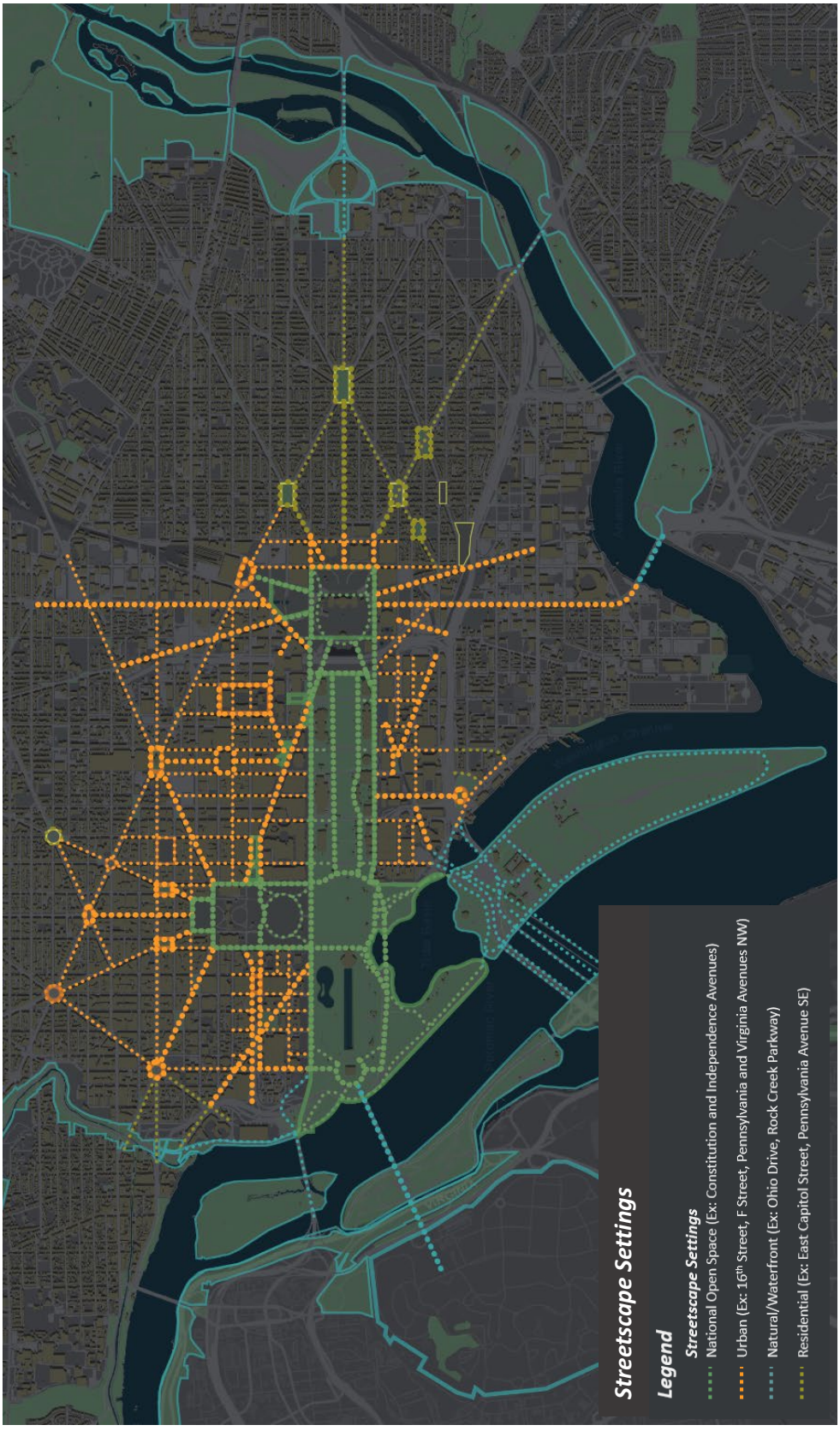
Ohio Drive SW
East and West Basin Drives

Local Streets:

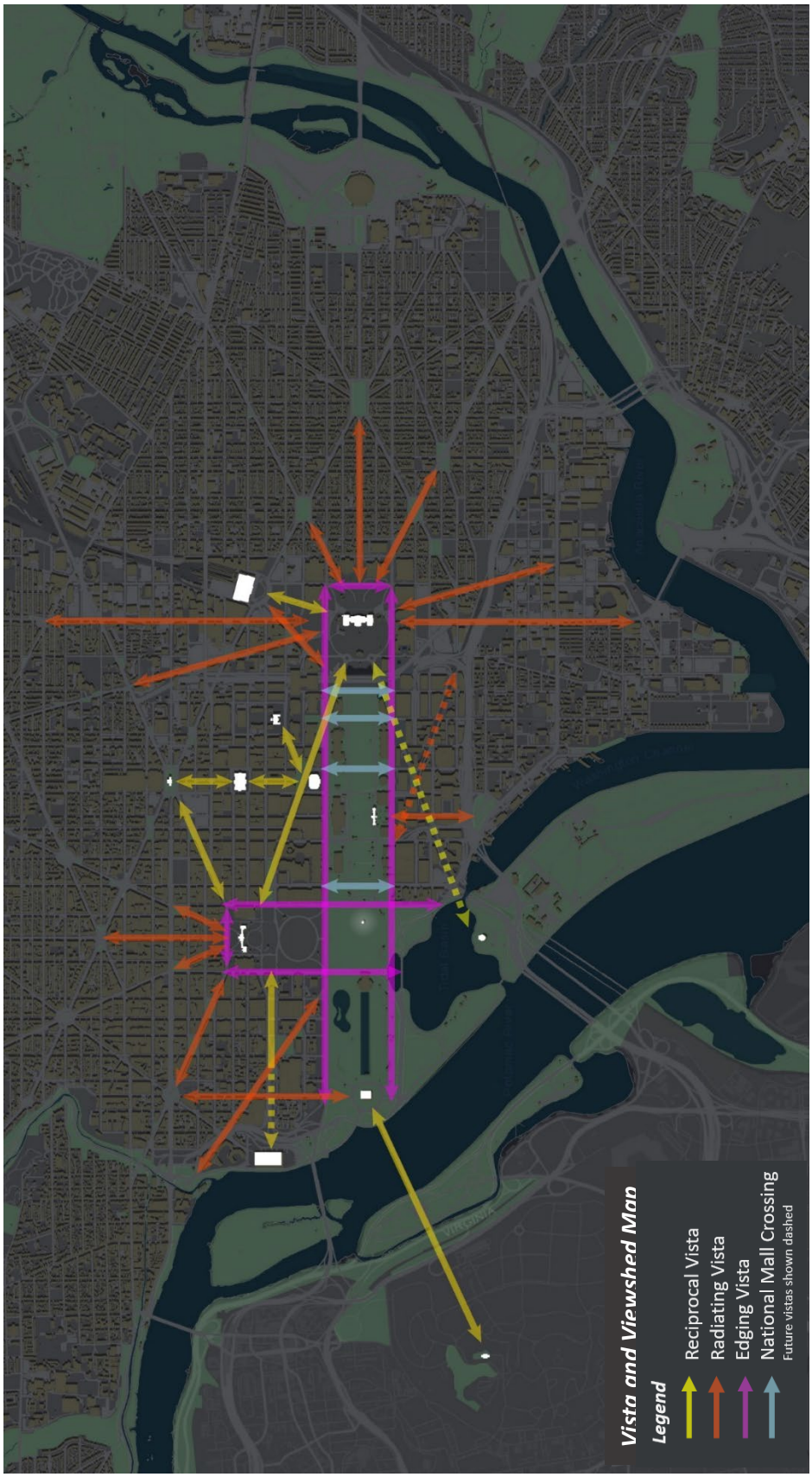
These streets are important because they form the urban street grid and provide circulation to other precincts and neighborhoods within the capital city. These streets have a variety of fixture types ranging from Washington Globes to Cobraheads and other Pendant pole fixtures and are in a variety of urban, residential, and natural settings and include for example:

G Street NW
M Street SW and SE
Portions of Maine Avenue SW
1st Street NE and SE
Portions of H Street NW and NE
Portions of 18th, 19th, 20th, 21st Sts NW

Streetscape Settings



Vista and Viewshed Map



Radiating and Edging Street Lighting Principles:

1. **Street lighting should enhance nighttime views to national icons:** Lighting levels on streets with symbolic connections (particularly reciprocal, radiating, or edging vistas terminating on illuminated structures) **should be dimmer than nationally significant structures** or open space focal points. This supports **enhancing and focusing views to important illuminated structures** at avenue and street termini. [3] Dimming of the District's streetlights can be achieved through coordination with DDOT's Smart Street Lighting Project.[4]
2. **Street lighting should support the National Mall's primary vistas and viewsheds:** Lighting levels on streets within important vistas and viewsheds (particularly streets crossing through or edging nationally significant open spaces) **should be dimmer than nationally significant structures** or open space focal points.
3. **Support the capital city's nighttime image and identity:** Lighting on streets radiating from or edging nationally significant structures or landscapes **should be slightly whiter (3,000K)[5] to differentiate**[6] these streets in the historic city core from streets through naturalized or other residential areas in other parts of the city.
4. **The Nationally significant open space setting should be dimmer:** Street lighting in the nationally significant open space setting should balance dimming (to highlight nationally significant structures) with safety and security needs required for vehicles, pedestrians, and adjacent property owners.

Connecting and Traversing Street Lighting Principles:

1. **Protect the Mall's viewshed:** Preserve the open primary viewshed within the center panel of the Mall between the U.S. Capitol Building and the Washington Monument by not permitting streetlights on north-south oriented streets in this zone.
2. **Street lighting should highlight the L'Enfant Plan:** Lighting on urban streets connecting significant structures or landscapes **should be slightly whiter (3,000K)[7] and/or brighter to differentiate**[8] these urban streets in the historic city core from streets in naturalized or residential settings in other parts of the city.
3. **Natural, waterfront, and residential settings should be dimmer:** Street lighting in natural, waterfront, or residential settings should balance highlighting nationally significant streets with

[3] This principle is compatible with the 1987 Conceptual Lighting Plan for the Pennsylvania Avenue Monumental Core recommendations.

[4] Additional study and on-site evaluation may be needed for these streets to develop and implement special lighting guidance that focuses views to nationally significant civic buildings, monuments, memorials, or open spaces.

[5] DDOT anticipates that Arterials (Principle and Minor) would have LED bulbs with a white 3,000 Kelvin color temperature.

[6] This principle is compatible with the 1992 CFA Conceptual Lighting Plan.

[7] DDOT anticipates that Arterials (Principle and Minor) would have LED bulbs with a white 3,000 Kelvin color temperature.

[8] This principle is compatible with the 1992 CFA Conceptual Lighting Plan.

the accommodating the needs of these sensitive settings by dimming street lighting to achieve low ambient light levels that shield habitats and aquatic life, and protect the night sky.

Local Street Lighting Principles:

1. **Soften the city's street lighting:** Street lighting in residential, natural, or waterfront settings **should be slightly warmer (2,700K maximum)[9] and dimmer** (depending on roadway class and land use) **to differentiate[10] the city's streets from streets in the historic city core** and to accommodate the needs of communities and environmental concerns.

[9] DDOT anticipates that Collector and Local roads would have LED bulbs with a warm white 2,700 Kelvin color temperature.

[10] This principle is compatible with the 1992 CFA Conceptual Lighting Plan.

Guidance Summary Chart:

Component Type & Tier	Color Temperature Guidance	Brightness/Dimness Guidance	Other Guidance
Structures: Civic Buildings, Memorials, Monuments, and Bridges			
Tier 1	Soft white (3,000K)	Most visually prominent in the nighttime sky.	
Tier 2	Soft white (3,000K)	More visually prominent than Tier 3 and the surrounding urban context.	
Tier 3	Soft white (3,000K)	More visually prominent than surrounding urban context.	
Landscapes: Parks and Open Spaces			
Tier 1	Soft white (3,000K) for nationally significant open space and urban settings. Warm white (2,700K) for natural/waterfront and residential settings and pedestrian walkways.	Brighter lighting in urban settings. Dimmer lighting in nationally significant open space, natural/waterfront, and residential settings.	Protect the primary nighttime vistas including the dim lighting on the Mall within the U.S. Capitol Building's western viewshed.
Tier 2	Soft white (3,000K) for nationally significant open space and urban settings. Warm white (2,700K) for natural/waterfront and residential settings and pedestrian walkways.	Brighter lighting in urban settings. Dimmer lighting in nationally significant open space, natural/waterfront, and residential settings.	
Tier 3	Soft white (3,000K) for nationally significant open space and urban settings. Warm white (2,700K) for natural/waterfront and residential settings and pedestrian walkways.	Brighter lighting in urban settings. Dimmer lighting in nationally significant open space, natural/waterfront, and residential settings.	
Streetscapes: Avenues and Streets			
Radiating & Edging	Soft white (3,000K) for nationally significant open space and urban settings. Warm white (2,700K) for natural/waterfront and residential settings and pedestrian walkways.	Brightness and dimness dependent on views to important illuminated structures. Generally, brighter lighting in urban settings. Dimmer lighting in nationally significant open space, natural/waterfront, and residential settings. (Streetlight dimming achievable through coordination with DDOT)	See the Pennsylvania Avenue Lighting Plan (1977) for more details on this street's unique lighting design.
Connecting & Traversing	Soft white (3,000K) for nationally significant open space and urban settings. Warm white (2,700K) for natural/waterfront and residential settings and pedestrian walkways.	Brightness and dimness dependent on views to important illuminated structures. Generally, brighter lighting in urban settings. Dimmer lighting in nationally significant open space, natural/waterfront, and residential settings. (Streetlight dimming achievable through coordination with DDOT)	
Local	Determined by DDOT (2,700K to 3,000K)	Determined by DDOT	Determined by DDOT

Attachment 1: White Light Policy

Note: The White Light Policy will be included in the Urban Design Element during a future update. In the interim, this policy statement can be used to guide decisions.

White Light Policy:

Federal buildings should be illuminated in white light to:

- Highlight civic structures;
- Harmonize the composition of buildings within the monumental core;
- Celebrate their national significance; and
- Convey dignity and respect for their institutions and branches of government.

Colored light and projected images on ***federal buildings*** should only be used on a *temporary* basis to celebrate art, festivals, or special public events.

National Park Service policy[11] prohibits directing additional lighting toward, changing existing lighting, or projecting images onto any monument or memorial.

Definitions:

Federal buildings: Nationally significant or civic buildings that include museums, offices, or other institutional buildings generally under the administration of the Architect of the Capitol, the General Services Administration, the Kennedy Center, the National Gallery of Art, and the Smithsonian Institution. Note: This does not apply to federal monuments, memorials, or bridges.

Temporary: For this application, temporary means several days or weeks, to a maximum of 30 days total[12], and not to occur longer than a cumulative total of three months if intermittent (occurring on non-consecutive days).

[11] NPS Event Planning Guide for National Mall & Memorial Parks Version 1.1 2016, Section 4.6.3, page 32.
[12] This draws from the NCPC/SI Illuminated Sign Agreement of 2018.

Attachment 2: Letter from the U.S. Commission of Fine Arts (June 2019)

U.S. COMMISSION OF FINE ARTS

ESTABLISHED BY CONGRESS 17 MAY 1910

401 F STREET NW SUITE 312 WASHINGTON DC 20001-2728 202-504-2200 FAX 202-504-2195 WWW.CFA.GOV

27 June 2019

Dear Mr. Acosta:

In its meeting of 20 June, the Commission of Fine Arts was pleased to hear two information presentations by the National Capital Planning Commission staff on the Monumental Core Streetscape Project and its proposed frameworks and policies for streetscape and lighting design, part of a comprehensive update of the *Streetscape Manual for the National Mall Road Improvement Program*. The Commission expressed appreciation for the efforts to revise the manual, and provided the following comments for its development.

Urban Design Streetscape Framework

In their discussion of the streetscape framework plan, the Commission members identified several issues for further study and clarification. At the broadest level, they advised that the plan should anticipate contemporary environmental issues, such as the impact of extreme weather and localized flooding, so that necessary adaptations of the streetscape can be planned for systematically, rather than on a case-by-case basis. They emphasized that the urban streetscape should be conceived of as a performative landscape system rather than as a composition of separate elements; they cited the presentation of classifying trees as distinct vertical elements, whereas the plan should consider trees to be a complex of living organisms requiring specific infrastructure to thrive within the streetscape. They also questioned the plan's emphasis on the thresholds identified between the National Mall and adjacent precincts within the monumental core, commenting that the boundary drawn between the broader monumental core and the surrounding city may suggest the location of significant thresholds. They advised that the city's major axial and diagonal roadways should be considered as the framework of the monumental city that reaches beyond the strict boundaries of the historic core, and they found that the streetscapes of these corridors should emphasize continuity. Accordingly, they suggested that the design approach to thresholds should derive from the identified hierarchy of street types, emphasizing either continuity or transition.

Street Lighting Policy and Framework

In consideration of the street lighting policy, the Commission members expressed general support for retrofitting the city's existing streetlights with light-emitting diode (LED) lamps, noting the reduced energy consumption, improved color, and more consistent background against which important buildings and monuments can be lit. However, they cited the existing hierarchy between the white light of the monumental core and the warmer light of the

surrounding city, and they expressed regret that this distinction may be lost when all streetlights are converted to the same color temperature; they suggested exploring ways to preserve this hierarchy. They noted that the spatial and architectural conditions of the city may be expressive enough without using street lighting to delineate the complex system of street classifications, and they therefore suggested simplifying the lighting framework. In general, they encouraged local and federal stakeholder agencies to consult with innovative urban lighting designers for the testing and implementation of this new street lighting technology, and they encouraged constructing in-situ mockups to test the criteria proposed in the policy.

The Commission looks forward to continued review of revisions to the *Streetscape Manual* as a product of the planning effort for the protection and stewardship of this nationally significant urban landscape and its infrastructure. For the development of the next submission, please consult with the Commission staff which, as always, is available to assist you.

Sincerely,

Thomas E. Luebke, FAIA
Secretary

Marcel Acosta, Executive Director
National Capital Planning Commission
401 9th Street, NW, Suite 500-N
Washington, DC 20004

cc: Laurin Lineman, Federal Highway Administration
Jeff Marootian, D.C. Department of Transportation
Peter May, National Park Service

Attachment 3: National Mall Streetscape Interagency Working Group Comments

National Mall Streetscape Interagency Working Group representatives collaborated on the development of the Lighting Policy and Framework from summer 2018 through spring 2019. Working group members' comments on the latest draft of the Lighting Policy and Framework are noted as follows:

- The NPS National Mall (NAMA) staff suggested the following: (1) changing the document title to "National Capital Public Realm Lighting Policy" to better represent the broader geographic area addressed; (2) adding a framework principle that supports reducing the negative environmental impacts of Designated Entertainment Area lighting; (3) categorizing the Kennedy Center as a Tier 2 Structure (However, NCPC and CFA staff agreed that the living memorial to President Kennedy warranted placement within the Tier 1 category); (4) adding a Symbolic Avenue category for Pennsylvania Avenue and adding parking areas and freeways.

- The NPS recommended that the White Light Policy also reference current NPS policy regarding monument and memorial lighting.

- The SI staff suggested that the White Light Policy refer to the NCPC/SI illuminated signage agreement letter.

- The AOC staff suggested that all buildings framed around Capitol Square be the same tier except the Supreme Court and the Jefferson building (Library of Congress), which should be higher tiers.

- The CFA agreed with NCPC that that the living memorial to President Kennedy warranted placement within the Tier 1 category.

- The DDOT staff caveated that streetlight dimming must also account for adequate lighting coverage for pedestrian and vehicle safety.

Attachment 4: Public Comments

Thursday, August 22, 2019, Ms. Linnea Warren

Dear Ms. Miller and Ms. Dowker,

I read in the Streetlight Advisory Panel's minutes that you attended its May meeting to discuss the NCPC's proposed revisions to its Streetscape Manual. Since I am very interested in DC's LED conversion project, I downloaded your April 2019 Information Presentation and your presentation to the CFA to learn more about the NCPC's proposed Lighting Policy and Framework. Though I was fascinated (and impressed) by the clever hierarchical approach it takes to highlighting DC's architectural treasures, I have a few comments to share with you and the NCPC.

My biggest concern is the NCPC's stated opposition to shielding our ubiquitous Washington Globes in an attempt to maintain their "historic appearance." The 1992 Streetscape Manual specified that 15% of the light cast by each Globe was supposed to shine upward to illuminate its silhouette, but the world has changed since then; that requirement no longer is reasonable. Scattering light indiscriminately instead of directing it where it's needed is an environmentally unacceptable waste of energy, and filling the sky with light at night has become an increasingly big problem (ironically, thanks in part to cheap outdoor LEDs). This interactive map shows how much DC's night sky has brightened over the past few years: https://www.lightpollutionmap.info/#zoom=9&lat=4724113&lon=-8584244&layers=0BTFFFFFFFFF.) Light pollution here has unusually significant consequences, since instruments at the US Naval Observatory set standards that are used in all kinds of satellite-based systems (including GPS).

I appreciate the fact that your working group is looking at which "BUG" rating might best balance historic preservation values with protecting the night sky, but I hope you are aware that not all lighting experts think it is the right measure to use for LEDs. (See for example the Department of Energy's December 2013 GATEWAY study on "Pedestrian Friendly Outdoor Lighting" and the lighting study done in 2014 for the National Park Service by the California Lighting Technology Center at UC Davis.)

Not only is illuminating an entire Globe fixture wasteful, it may not even be possible with LEDs. LED technology is totally different from what has been used over the past century. Instead of bulbs that shine in all directions, they use flat arrays of laser-like diodes. That may work in cobraheads that only face down, but it's awkward inside a sphere.

OP3 and DDOT still don't know if it's even *possible* to retrofit our historic Globes, let alone how to ensure that their entire outline is visible at night. But they know the unpleasant side effects of LEDs are well-known and unpopular, so in public presentations they have promised that residents will be shielded from bothers like light trespass and glare.

It's inconceivable that DDOT would develop two different retrofits, one without shields for fixtures in the NCPC's jurisdiction and one *with* shields for the rest of DC. If the NCPC insists on applying a standard adopted in 1992 for outdated technology, DDOT won't be able to fulfill its promise, which would be a disaster for all of us who live near these glaring lights. (Like me; there are about *eight* Globes around our building, which already cast light deep inside our home. With LEDs, it would be nightmarish.)

This photo of a street in Liberal, Kansas, perfectly illustrates the situation.

https://www.darksky.org/our-work/lighting/lighting-for-citizens/bad-streetlights/

Since one of the reasons given for updating the Streetscape Manual is to adapt to changing technologies anyway, I urge you to drop this provision now. Instead, please help us figure out a way to make attractive historical fixtures palatable under modern lighting conditions.

DC's lighting is not strictly historically accurate anyway – I doubt that streetlights a hundred years ago were as bright as they are now. I've been looking at old photos recently and can't help but wonder why the Washington Globe is THE "historic" streetlight. Lots of other styles were used before it appeared in the early 1900s, some of which *are* adaptable to LEDs. For example, look at the fixture in this 1891 photo from Alexander Mitchell's "Washington, D.C.: Then and Now." It's actually quite similar to designs already offered by LED manufacturers. (Some are in place along the Klingle Valley trail.) Deflectors or shields still might be needed to keep light from going sideways into people's homes, but they would be easier to install in this than in a globe.

I also have some comments on your attempts to visually delineate different areas of DC with lighting, which basically is a terrific idea. But regarding the concern expressed at your June presentation to the CFA about losing the color differences that can now be seen from above DC, I wouldn't worry. I suspect they are due more to happenstance than design (and probably just the unintended result of the adoption of sodium vapor lights in the past.)

There *is* more of a color range available with LEDs than your draft suggests, though most of the available options are at the end of the spectrum that is most problematic for the environment, people's health, animals, etc. So the "pure white light" specified for the Monumental Core in the 1992 Manual raises a big red flag in the context of LEDs, which are able to produce much whiter (and bluer) "whites" than were available then, and which are better avoided because of their serious negative effects. I would ask that you be more specific about what you want in light of LED technology, using not just words but Kelvin ratings and other technical specifications. But you may be disappointed if you expect to see a significant difference between 3000K and 2700K LEDs; the chart of page 17 of your Draft Lighting Policy and Framework may be cutting the bologna a bit too fine, since there is no exact correlation between the descriptions you use and the color temperatures indicated. For example, the terms "soft white" and "warm white" are both used to describe the same range of color temperatures.

But you could still use characteristics other than color to create the same kind of distinctions – for example, by varying the brightness of streetlights in different areas. (Or, to return to the Dark Sky issue, by reducing or even eliminating uplighting, which would emphasize the brightly lit buildings inside the Monumental Core.) DDOT is pushing for far brighter streetlights that many

residents want – in some cases, 16 times the levels required by ASHHTO. Perhaps here the NCPC's interests coincide with that of residents who are concerned that our city's streets are going to look like a used car lot. Perhaps we can work together to convince DDOT that more light is not always necessary OR desirable, so we should turn down the lights outside our homes.

The supposed savings of LED streetlights are just too irresistible for cities to ignore. Please help us prevent DDOT from ruining the appearance and livability of the DC just to save money (they hope.)

Thank you for all that you do to preserve the beauty of this wonderful city!

Linnea Warren
Woodley Park

Friday, August 23, 2019, Ms. Linnea Warren

May I add one other bit of info? The citizens group that has been pushing for 2700K LEDs chose that temperature not because it is ideal but because it was the best choice available at that time. DDOT has reluctantly accepted it as the standard for some areas, though it keeps pushing for higher color temperatures (IMHO, because they result in larger cost savings and are better for taking surveillance photos.)
But even 2700K LEDS have a lot of unpleasant side effects and they aren't uniform – there is a lot of variation among manufacturers. So some of us have asked why DC is rushing into this now, while the industry is actively developing more user-friendly LED lighting.

In fact, I just read about a company in Spain that has already installed streetlights with even lower color temperatures. I searched for it online; it's called IGNIAlight and these particular lights are "2200K PC Amber LEDs." Even better, their entire line of outdoor luminaires apparently is available in 1800K and 2200K, along with the usual 3000K and 4000K. https://www.ignialight.com/en/projects/detail/id/29/pc-amber-street-lighting.

https://www.ignialight.com/en/category/led-street-lighting. I wonder how many other companies are producing similar ones? Sure hope DC isn't prematurely committing us to an unpopular option while the industry is coming out with better ones.

LEDs like these would be much better for DC's many natural and environmentally sensitive areas, let alone its residential streets, and since their color is "warmer," they might also help you achieve your lighting hierarchy goals. The NCPC would do a tremendous service to the entire District if it would resist DDOT's push for 3000K lights – why not use 2700K on major thoroughfares and 1800 or 2200K in residential areas?!

Thanks very much for adding this to the email I sent yesterday, and for passing it on to Elizabeth and Meghan!

Linnea Warren

Sunday, November 3, 2019, Ms. Laura Phinizy

Hello, Elizabeth and Meghan. I am a resident of Ward 4. To date, my experience with the National Capital Planning Commission (NCPC) has been limited but positive. A few years ago I testified at a NCPC hearing against the DC Office of Planning's efforts to have the Height Act repealed. I felt that the Height Act was important for our city's character and was gratified that the NCPC chose to uphold the Height Act. Now I am writing with a different perspective - as a member of the Mayor's Streetlight Advisory Panel - and I would like to ask that the NCPC change its position on street lighting.

1. Fixtures. In the Monumental Core Streetscape Project, Urban Design Streetscape Framework and Lighting Policy found at this link,

https://www.ncpc.gov/docs/actions/2019November/7886_Monumental_Core_Streetscape_Project_-_Urban_Design_Streetscape_Framework_and_Lighting_Policy_Staff_Report_Nov2019.pdf

NCPC states, "Washington Globes have stood the test of time." As a sculpture, yes. The Twin-Twenties and Globes have lovely proportions and detailing that are timeless and yet evocative of our history. In fact, they are our history, having been designed here, by the Commission on Fine Arts.

However, as a street lighting fixture, these fixtures are no longer appropriate, and in fact are harmful to our city. The vast majority of light emanating from the globes goes outward or upward, not downward toward the ground. Shielding these globes for glare is not possible, and the Commission on Fine Arts (CFA) has asked that the uplight NOT be eliminated entirely. When fitted with LEDs, the Globes throw off tremendous glare and uplight with significant consequences for health and safety:

1) Disruption to human circadian rhythms. Light at night depresses production of melatonin, which the body uses to suppress cancer. Light pollution is also linked to increases in obesity and depression, among others.

2) Disruption for migratory birds and nocturnal animals. Light at night stresses the

immune system of birds, which means that their immune systems take longer to fight off viruses like West Nile. By staying infected longer, birds can infect more mosquitoes, which can in turn infect more people.

3) Stress on plants. Many plants need downtime - absence of light - in order to grow or produce fruit. Stressed plants reduce habitat for wildlife, absorb less heat from urban heat islands, and produce less oxygen.

4) Disruption of the work of the US Naval Observatory, whose measurements are critical to properly calibrated GPS, on which both our first responders and sophisticated military hardware depend.

Are the Washington Globes worth dead birds? Dead plants? Sick people? Cancer?

Innocent civilians struck by a missile that hit 500 feet from its intended target? If we look at the true consequences of using today's technology in these fixtures designed a century ago, we simply can't justify their continued use, no matter how sentimentally attached to them we are.

I would ask that the NCPC and CFA work with an urban lighting designer to find alternative fixtures for that follow the best practices for protecting the environment, human health, and national security functions of the US Naval Observatory. Second, I ask that until such fixtures are identified, that NCPC allow any Globes/Twin Twenties that are converted to LEDs to be fully shielded for uplight and limited to the minimum light sufficient for safety. As the NCPC's slide showed, the city has been home to many fixtures in its history. We would be a model to cities around the world if we could have beautiful fixtures while safeguarding the people, plants, and animals who live here.

2) Color. I agree with NCPC that the lights outside the core should be warmer than those inside; however, lighting the core at 3000K is too blue. LED lights at that color temperature will double, if not triple, the skyglow from our current sodium lights, with all the negative effects I outlined in point 1.

I would ask that NCPC set 2700K as the standard for the core, and that they urge DDOT to be more flexible in their criteria to allow lower-temperature fixtures in the areas outside the core.

3) Gateways. I noted that the NCPC would like to have prominent gateways at many entrances to the city.

I would ask that NCPC refrain from recommending configurations that would increase light levels beyond what is necessary for safety or that would increase light pollution at those gateways.

4) Consistency along sight lines. NCPC asked that lighting be consistent along the length of a street. Some streets, such as Connecticut Avenue, have commercial sections, mixed use sections, and residential sections. DDOT has agreed to lower the brightness and color temperatures in residential sections.

I would ask that NCPC refrain from mandating configurations that would increase light pollution or brightness in residential or mixed-use areas.

I ask that these notes be included in the public record.

Thank you,

Laura Phinizy
Member
Streetlight Advisory Panel

Sunday, November 3, 2019, Mr. Wayne Savage

The anachronistic Washington Globe fixtures are incompatible with a modern street-lighting system that limits light pollution. They emit light promiscuously in all directions, including horizontally – a major contributor to skyglow that obscures the stars. D.C.'s street light conversion project is a once-in-a generation opportunity to address this problem.
It's worth noting that the Washington Globe design does not accurately represent fixtures that were actually used in turn-of-the-20th-Century Washington, and dark-sky compliant street lights are now available in a variety of alternative "historic" designs.

If the Washington Globe fixtures must be retained, their environmental harm should be mitigated by installing internal optics directing all light downward, where it's needed, or by limiting their illuminance to a very low, esthetically pleasing level while relying on adjacent LED fixtures for traffic and pedestrian safety.

Thank you for considering my concerns.

Wayne Savage
Tewkesbury Place N.W.

Sunday, November 3, 2019, Ms. Bonnie Garrity

Dear Ms. Miller and Ms. Dowker,
I have volunteered as an advocate for responsible outdoor lighting practice for 22 years, and watched the night sky steadily get brighter and whiter, even in communities whose policies list the reduction of light pollution as an important goal in their lighting plans. I hope we can do better in the District.

I appreciate all the work that you do in order to showcase and enhance views of our Monumental Core; but I do have concerns about the new LED conversion for D.C., and I hope you will read this letter and accept it for the record of public comment for NCPC lighting guidelines.

What I have seen so far of LED retrofits inside Washington Globes has been disheartening. I have noticed significant glare emitted from these fixtures, impairing my vision instead of illuminating my view, preventing me from feeling safe after dark when driving or crossing streets, and obscuring the view from the street of the evening streeetscape.

Near my home in Dupont Circle, the globes with LEDs are shining more wasted light up in the trees than useful light on the pavement, making the ground appear dark by comparison, and entering peoples' homes. The white LEDs used so far inside the globes give poor quality of illumination, wasting much light and adding considerable light pollution over the traditional high pressure sodium lights. This waste contributes to climate change. It impoverishes bird, animal, plant, and peoples' health, disrupting circadian rhythm. Scientists are discovering that light pollution is responsible in part for rapid decline of pollinating insects. And now research is pointing to a causative effect of light pollution on air pollution.

It is a fact that replacing the amount of yellow light from our traditional high pressure sodium lights with the same amount of white LED light increases the visible light pollution in the sky by 2 to 3 times. This science was proven at Flagstaff Naval Observatory several years ago, and is echoed by Jeff Hall at Lowell Naval Observatory in his recent comments in an ArsTechnica article. Janelle from the US Naval Observatory presented in March to DDOT's Street Light Advisory Panel meeting, and told us that the District's sky glow is at the highest level on the Bortle Dark Sky scale, an 8/9 out of 9. She requested that we not install fixtures with any blue light; that light levels stick with IES recommendations; and that shielding direct all light 10% below the horizontal plane. Adding more light into the night sky is not compatible with USNO's mission to determine precise time that supports our Navy and our Dept. of Defense in navigation and communications.

The white light shining from the globes at night contains blue light that was not present in the warm light of 90 years ago, and they certainly emit much more light today. Are the poles spaced closer together now? In the daytime, these long lines of numerous light poles can feel like a forest of light poles that create clutter, detracting from, rather than enhancing, our significant architecture.

This can't be historical, surely. Nor healthy, nor environmentally sustainable. And yet here we are as a city, collectively laying out a plan that will do just this—add even more unsustainable amounts of wasted light that will harm us and our environment.

What can you do to help? Would removing every other Washington Globe in the Monumental Core be feasible? If this were done, and the light amount drastically reduced in each globe, then fully shielded street lights could supplement illumination. This would reduce wasted light.

I applaud your suggestion of an urban lighting designer, and DDOT's Street Light Advisory Panel is also asking for this. But if esthetics are the primary focus, and not human health and safety, it is not likely to be an improvement. There surely must be a way, though not easy, for our city to take the lead in producing an environmentally sustainable, esthetically pleasing, healthy safe level of light in the district.

Thank you for your commitment to this effort.

Bonnie Garrity
Ward 2
1545 18th St. NW Washington, D.C.

Sunday, November 3, 2019, Ms. Delores Bushong

Dear Ms. Spigle Dowker:
I am a member of the Mayor's Streetlight Advisory Panel (SAP)and was present at the presentation from NCPC and CFA at its May 2019 meeting. I am not sure whether you expected members of SAP to submit our concerns in writing as well, but I have just finished

reading the documents posted on the NCPC website for its November 7th meeting in their entirety, and I am taking this opportunity to do that.

At the SAP's May meeting, I brought up several concerns after your presentation that I don't see addressed in the proposed Lighting Policy.

One is whether NCPC was aware of the concerns of the US Naval Observatory about the over lighting in the District and the effect it was having on their mission, in particular critical defense functions. You said you were aware of these concerns. However, I see no mention or accommodation for the concerns stated by USNO in these documents.

USNO gave a presentation to the Streetlight Advisory Panel in January. They gave very detailed information about lighting principles, the USNO mission, and the impact of light pollution on that mission, including the fact that they cannot filter the blue light which is dominant in LED lights. They are science and defense experts and I think NCPC should consider and support the important reasons they are requesting a lowering of both kelvins and lumens in the city. For your information, I am attaching the PowerPoint of the presentation they gave for NCPC members to review.

The second issue I raised in the meeting was NCPC's choice of 3000K lights in the monumental core. More than 116,000 residents voted on resolutions through their ANCs to limit streetlights to 2700K. The 2700K is also the CCT supported by USNO.

I question two statements in the Policy Staff Report which seem to be opinion, not fact. In the Lighting Policy and Framework Briefing Packet, it states on page 4 of attachment 2, under the topic heading "Background and Context", "Vehicle speeds have increased along with demands for higher illumination to compensate for the glare of headlamps and the need to make traffic decisions quickly. Higher wattage incandescent lamps were followed by more efficacious mercury lamps (with their distressing blue-green cast) and most recently by high pressure sodium lamps (with their distorted yellow-orange color and intolerable glare" [Italics mine]. In the first statement I am questioning a decision that would add significant light pollution by increasing illumination to compete with car headlights that I agree are glary and are now mostly LED. I have not seen any traffic studies, and I have read many, that suggest that increasing illumination would improve traffic safety. Is there data to support this statement?In the second statement, has anyone compared the glare from an HPS fixture to the glare from an LED fixture? To use the term "intolerable" without some investigation into the glare from both types of lighting is certainly not scientific. I am not suggesting that we continue using HPS lights as they do use more energy, merely that these comments seem speculative at best. When we are discussing an issue as important as streetlighting, we need to stick to data.

As noted in your document, LED technology is changing rapidly. NCPC needs to investigate other LED options that have recently become available. I've provided a link that both pinpoints some of the negative issues with LEDs as well as solutions that Flagstaff, AZ, considered. I think we can learn from others who have already converted to LED streetlighting.

https://arstechnica.com/science/2019/10/how-flagstaff-arizona-switched-to-leds-without- giving-astronomers-a-headache/

I support several ideas offered by the US Commission of Fine Arts. They suggested that perhaps the architecture and spatial design of the Federal city meant that using street lighting to show the differences in Federal and local designations may not be necessary even though this was done in the past.

Perhaps most importantly, they suggested that local (DC) and federal agencies hire lighting designers with municipal experience to guide the implementation of this new technology. This is a step that many members of the Streetlight Advisory Panel have been urging DDOT to do.

LED lighting is very different from incandescent or high-pressure sodium. DDOT and NCPC should consider not only the energy and carbon savings but the effect this kind of lighting has on animals and plants in the environment, the night sky, our national security (as noted by USNO), and the ambiance in our city at night.

The overall goal should be to bring the lighting levels down in the District. Hopefully, one day a photo from space won't show the District of Columbia standing out from our neighbors in Virginia and Maryland. Instead, it will show a city that is aware of the many negative effects of light pollution by its use of light that is subdued, while sufficient. Any light beyond that is wasted energy (and money, of course) and polluting.

Thank you for the opportunity to add these comments to the discussion.

Sincerely,

Delores Bushong

2030 Hamlin Street, NE

deloresbushong@hotmail.com

Monday, November 4, 2019, Ms. Delores Bushong

I forgot to attach the PowerPoint from USNO in my earlier email as intended. Please include it as part of my comments. Thank you.
Delores Bushong

Monday, November 4, 2019, Mr. Lee Mayer

NCPC Officials:

As a member of the International Dark Sky Association I, and many of my colleagues, have provided input on DDOT's LED streetlighting proposals for the District of Columbia. I am a Certified Facility Manager and the former (retired) VP of Real Estate and Facilities for the Watergate Office Building located across the street from The Kennedy Center. I was an ANC Commissioner (3G01) many years ago.

Given the short time I've had to submit comments I was unable to review the document as much as I would've liked. The lack of adequate public notice is a problem.
With that said, I have the following comments on your 137 page report:

- The historic Washington globe lights are a symbol of a bygone era. While aesthetically pleasing, there are better alternatives available that mimic the CFA favored old-style look. We, and you know that globe lights contribute to light pollution and waste electricity and money. Double globe lights are even more inefficient. NCPC should consider retrofitting globes with a downlit LED fixture. An example of one such fixture can be seen on East West Highway outside of the Waverly parking garage in Bethesda, Maryland. (See attached pictures). I would be happy to facilitate a tour or gather specifications if this would be considered.
- According to the AMA, excess blue light in LED fixtures has a detrimental effect on human, animal and plant life. LED lights should have a color temperature should of 2700 K or less; especially in residential neighborhoods (ex: McArthur Blvd which you identify as a "gateway" and subject to your lighting proposal). Many residential streets have older high pressure sodium light fixtures that emit light in the 2000K - 2200 K range which is adequate and has been for decades.
- All fixtures should be retrofitted to be fully shielded to reduce light pollution.
- Over lighting with LED fixtures causes excessive glare making it more difficult to see; especially for older adults. A perfect example of this are the LED light fixtures installed on Beach Drive adjacent to Candy Cane City in Rock Creek Park. These lights are blinding to drivers who transition from darkness to excessively bright LED street lights.
- It is folly to think that once installed and set, lights will be dimmed. What process would be implemented that allow for dimming light fixtures?
- The NCPC should not be involved in setting light levels for gateways and arterial streets. Those streets do not need special, increased or different lighting.
- To think that higher illuminations on gateway streets will provide an "intuitive wayfinding to and through (the) monumental core" is unrealistic. If the NCPC feels that the monumental core is difficult to find then they should improve the signage which will have less of an environmental impact and be less wasteful of money and electricity. Most people have GPS so finding the monumental core is easy. You're fixing a problem that doesn't exist.

I appreciate what you're trying to do, but this is not a process that should be thrown in front of the public at the last minute. I will be attending the session at Roosevelt H.S. if you would like to discuss my comments. I am also available to meet with you at your convenience.

Regards,

Lee Mayer

Final LED Streetlight Performance Criteria

Prepared by: the National Capital Planning Commission
on behalf of the National Mall Roads Interagency Working Group
with technical assistance from Stantec

Date: July 2024

Contact:
Urban Planner, Ben Turpin, ben.turpin@ncpc.gov, 202-482-7247
Long Range Planning Director, Michael Sherman, michael.sherman@ncpc.gov, 202-482-7254

Table of Contents

Introduction

This technical guidance addresses engineered components and illumination levels or measurements for streetlights along roads, sidewalks, and pedestrian walkways within areas of the capital city's monumental core. These streets are illustrated on the Streetscape Classification map on page 15, the Streetlight Fixture map on page 16, the Roadway Classification map on page 19, and the Nighttime Pedestrian Volumes map on page 20. Federal and local agencies are replacing luminaires to improve energy efficiency. LED (light-emitting diode) light sources are the preferred energy efficient technology. The following technical guidance coordinates illumination transitions between federal properties within the monumental core and the DC Smart Streetlight Program, which is retrofitting the entire city's streetlighting system to LED luminaires.

This guidance is based on current (2024) technological capability and availability. The following guidance and standards are most applicable under current conditions. As technology evolves, this guidance will need to be updated to address technological advancements and performance improvements.

Importance and Background:

Street lighting provides illumination and visual information or detail for safe movement as well as contributing to the desired ambiance within the monumental core of the capital city. The design of streetlighting is important for its effect on nighttime views and ambiance, relationship to surrounding areas, and effect on illumination of buildings and landscapes. The quality of street lighting is defined by various technical lighting components including luminance, illuminance, color rendering, color temperature, distribution patterns, glare and uplight.

Streetlight luminaire design is important since it contributes to the daytime and nighttime appearance of Washington's historic street lighting units; the Washington Globe and Twin-Twenty. These historic lights are located along the curbs of major avenues and streets. Light source placement within the fixture and light control features such as reflectors can help control the light orientation and quality. These components are important for pedestrian and motorist comfort. Well-designed luminaires can help to minimize glare. The placement of streetlights can create gradual transitions between light and dark. Light distribution patterns are also important because of sensitivities to light in residential and naturalized areas, as well as the desire to protect night skies by limiting the amount of light shining upward.

The color quality of light contributes to the image and identity of the capital city. White light is integral to the monumental core and harmonizes with the monuments, memorials, and buildings illuminated in cool white architectural light. To perpetuate the classic image and maintain the dignity of the national capital and to focus vistas and viewsheds on civic monuments and memorials, streetlight color temperature should have a consistent warm white color. Streetlight color rendering should accurately depict the range of hues found in the memorial, monument, and civic building materials**.**

Comfort and safety for pedestrians and motorists is an important and fundamental purpose of street lighting. Streetlights need to be bright enough for drivers to see roadways and for pedestrians to navigate sidewalks and pathways. However, brightness needs to be balanced with sensitivities to light in certain settings.

LED Streetlight Definitions

Streetlight Definitions:

Bracket (mast arm): An attachment to a lamp post or pole from which a luminaire is suspended.

Illumination: The characteristics of light – the intensity or brightness; color temperature/color rendering; as well as the light pattern.

Lamp (bulb): The light source. While past lamping included metal halide, high pressure sodium, or incandescent light sources, current energy efficient lap technology is LED (light-emitting diode).

Lamp post (pole): A standard vertical support provided with the necessary internal attachments for wiring and external attachments for the bracket and luminaire.

Post-Top Luminaire: An outdoor luminaire that is mounted directly on top of a lamp-post. This may include a bracket arm which allows for multiple luminaires, in this case the luminaires mount directly on top of the bracket arm. This includes Twin-Twenty, Washington Globe, and Olmsted fixtures. See the Streetscape Manual – Interagency Initiative for National Mall Road Improvement Program (2013) for more detail and illustrations of these fixtures. This category of luminaires does not include Cobrahead or other types of Pendant fixtures.

Street lighting unit: The assembly of a pole or lamp post with a bracket and a luminaire(s), for example, Washington Globe or Twin-Twenty.

Street lighting luminaire (Light Fixture): A complete lighting device consisting of a light source and ballast, where appropriate, together with its direct appurtenances such as globe, reflector, refractor, housing, and such support as is integral with the housing. The pole, post, or bracket is not considered part of the luminaire.

Luminaire Component Definitions:

Lamp: A generic term for a man-made source created to produce optical radiation. By extension, the term is also used to denote sources that radiate in regions of the spectrum adjacent to the visible.

LED lamp, integrated: An integrated assembly comprised of LED packages (components) or LED arrays (modules), LED driver, ANSI standard base and other optical, thermal, mechanical and electrical components. The device is intended to connect directly to the branch circuit through a corresponding ANSI standard lamp-holder (socket). *This is typical of an LED replacement lamp for a residential luminaire.*

LED light engine: An integrated assembly comprised of LED packages (components) or LED arrays (modules), LED driver, and other optical, thermal, mechanical and electrical components. The device is intended to connect directly to the branch circuit through a custom connector

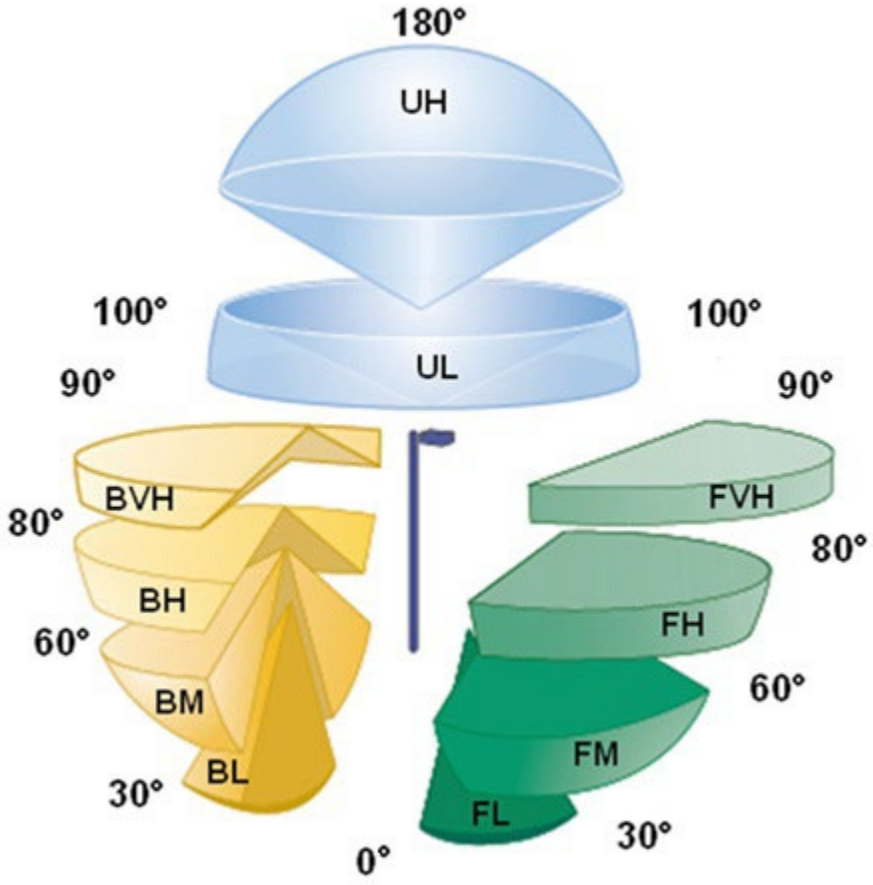
compatible with the LED luminaire for which it was designed and does not use an ANSI standard base. *This is typical of a complete LED Luminaire.*

LED lamp, non-integrated: An integrated assembly comprised of LED packages (components) or LED arrays (modules), and ANSI standard base. The device is intended to connect to the LED driver of an LED luminaire through an ANSI standard lamp-holder (socket). The device cannot be connected directly to the branch circuit. *This is typical of an LED replacement lamp for a commercial/industrial luminaire.*

Light Emitting Diode (LED): A p-n junction semiconductor device that emits incoherent optical radiation when forward biased. The optical emission may be in the ultraviolet, visible, or infrared wavelength regions.

Illumination Definitions:

BUG (Backlight, Uplight, and Glare) ratings: An outdoor environmental classification system based on the maximum lumen output in the three primary solid angles (backlight, uplight and glare) of a luminaire's distribution. The B, U, and G ratings range from 0, the most limiting, to 5, the most lenient. This rating system has largely replaced the previous classification system of full-cutoff, cutoff, semi-cutoff, and non-cutoff.



Lumen Values for BUG Ratings

Table 2-1. Backlight Ratings

	Secondary Solid Angle	B0	B1	B2	B3	B4	B5
	BH	110	500	1000	2500	5000	>5000
	BM	220	1000	2500	5000	8500	>8500
	BL	110	500	1000	2500	5000	>5000

Table 2-2. Uplight Ratings

	Secondary Solid Angle	U0	U1	U2	U3	U4	U5
	UH	0	10	50	500	1000	>1000
	UL	0	10	50	500	1000	>1000

Table 2-3. Glare Ratings for Asymmetrical Luminaire Types (I, II, III, IV)

	Secondary Solid Angle	G0	G1	G2	G3	G4	G5
	FVH	10	100	225	500	750	>750
	BVH	10	100	225	500	750	>750
	FH	660	1800	5000	7500	12000	>12000
	BH	110	500	1000	2500	5000	>5000

Table 2-4. Glare Ratings for Symmetrical Luminaire Types (V and VS)

	Secondary Solid Angle	G0	G1	G2	G3	G4	G5
	FVH	10	100	225	500	750	>750
	BVH	10	100	225	500	750	>750
	FH	660	1800	5000	7500	12000	>12000
	BH	660	1800	5000	7500	12000	>12000

Notes for tables 2-1 through 2-4:

- Any rating is determined by the maximum rating obtained for that table. For example, if the BH zone is rated B1, the BM zone is rated B2, and the BL zone is rated B1, then the backlight rating for the luminaire is B2.

Color Rendering Index (CRI): An indication of how well a light source renders colors as compared to a reference source of the same color temperature. A CRI of 100 represents the maximum value. Lower CRI values indicate that some colors may appear distorted when illuminated by the lamp. Color distortion generally occurs with CRI values less than 90. For reference, incandescent lamps have a CRI above 95. Cool white fluorescent lamps have a CRI of 62 to 80.

Correlated Color Temperature (CCT): The color appearance of the light source when energized. CCT is measured in Kelvin, which spans a color spectrum from blue sky (>10,000 Kelvin) to warm white incandescent lamps (3,000 Kelvin) to match flame (<1,700 Kelvin).

Glare: 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 of visual performance.

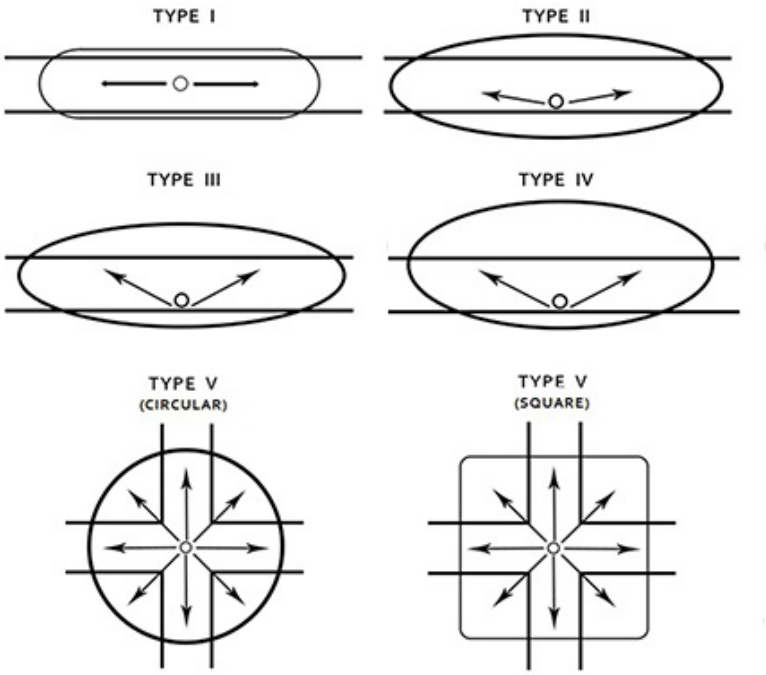
Horizontal Illuminance: The amount of luminous flux striking a horizontal surface per unit area, such as a roadway or a floor.

Illuminance: The amount of luminous flux striking a surface per unit area. Illuminance is measured in foot-candles (lm/ft^2) or lux (lm/m^2).

Light Control: Applying physical components to direct and disperse the light emitted from a light source. The most common light control components are reflectors, refractors, diffusers and louvers or shields. Reflectors are devices usually made of coated metal or plastic that exhibit high reflectance shaped to redirect by reflection the light emitted by a light source. Refractors are light control devices that take advantage in the change in direction light undergoes as it passes through the boundary of materials differing in optical density. Diffusers are light control elements that scatter and redirect incident light in many directions. Louvers and shields are opaque or translucent materials shaped or configured to reduce or eliminate the direct view of the light source from the outside of the luminaire.

Light distribution pattern: A classification system based on the shape of the area that is primarily illuminated by the luminaire. There are six main light distribution types:

Type I – Narrow, symmetric illuminance pattern.
Type II – Slightly wider, more asymmetric illuminance pattern than Type I.
Type III – Wide, asymmetric illuminance pattern.
Type IV – Asymmetric, forward throw illuminance pattern.
Type V – Symmetrical circular illuminance pattern.
Type VS – Symmetrical, nearly square illuminance pattern.



Light Loss Factor (LLF): The ratio of illuminance for a given area to the value that would occur if lamps operated at the (initial) rated lumens and no system variation or depreciation had occurred. The LLF includes two major components, Lamp Lumen Depreciation (LLD) and Luminaire Dirt Depreciation (LDD). With LED technology in its current state, most quality LED luminaires have an L70 (time to 70% of initial output) rating of at least 100,000 hours, it is recommended that the LLD value be taken at mean life or 50,000 hours, typically the LLD is 0.92. The LDD value for luminaires is dependent on the environment, the shape of the luminaire and the exposure of the luminaire lens and reflectors to dirt accumulation.

Luminance (photometric brightness): The intensity of light emitted from a surface per unit area in a given direction. Luminance is measured in candela per square meter (cd/m^2)

Luminous Flux: The quantity of the energy of the light emitted per second in all directions. The unit of luminous flux is lumen (lm).

Mounting Height: The vertical distance between the luminaire source and grade.

Vertical Illuminance: The amount of luminous flux striking a vertical surface per unit area, such as a wall or a person's face.

LED Streetlight Performance Criteria

The *LED Streetlight Performance Criteria* specify the quality of street lighting in the monumental core in the following three sections:

- Streetscape and Special Lighting Fixture Area Classifications
- Streetlight Illumination Criteria
- Streetlight Design Implementation

Applicability:

The following criteria apply to streetlights under federal jurisdiction located on sidewalks that illuminate roadways and public sidewalks. These criteria do not apply to lighting located within building yards.

Streetscape and Special Lighting Fixture Area Classifications:

To specify the nighttime feeling and quality of streetscapes in the monumental core, the following *Streetscape and Special Lighting Fixture Area Classifications* describe the streetlight quality, fixture styles, and performance criteria for various street categories (and federal bridges). The *Streetscape Classifications* and *Streetlight Fixture* locations are mapped within this document. In addition, Table 1 provides technical criteria for each streetscape and special lighting fixture area. Detailed drawings and descriptions of the luminaire and street lighting units referenced in this section can be found in the Streetscape Manual – Interagency Initiative for National Mall Road Improvement Program (2013).

Web-Link: https://www.ncpc.gov/docs/Mall_Streetscape_Manual_March2013.pdf

1. **Special Lighting Fixture Areas** – The streetlight fixtures for these roadways are intended to stand out from the rest, because they are either preeminent roads from the historic L'Enfant Plan of the City of Washington, DC, or have streetscape elements contributing to the character of special areas or historic districts. These include:
    - **a.** Pennsylvania Ave [tiered suite of cobrahead, Washington Globe with eagle finial, and pedestrian lights]
    - **b.** Capitol Square Walkways [Ladder Rest Globe]
    - **c.** Kutz Bridge [Saratoga style lights]
    - **d.** 10th Street SW (L'Enfant Promenade) [10th Street mall style lights]

2. **Radiating & Edging Streets** – These roadways are the focal points of the monumental core, are iconic, and have national significance. They are typically located in urban settings and include retail, office, civic, and cultural uses. These roadways also front civic and culturally significant buildings and open spaces. The streetlighting should provide ambient lighting to sidewalks and building facades. These streets typically have the Twin-Twenty luminaire, though some streets have Washington Globes.

Examples: Constitution and Independence Avenues (between 23rd NW/SW and 2nd NE/SE, Virginia, New York Avenues

3. **Connecting & Traversing Streets, Major** – These roadways are typically located in urban settings and include retail and office uses. While not as prominent as Radiating & Edging Streets, the streetlighting should provide ambient lighting to sidewalks and building facades. These streets typically have the Washington Globe luminaire.

   Examples: Massachusetts Ave NW/NE, New Hampshire and Rhode Island Avenues NW, K & F Streets NW; 14th, 12th, 9th Street NW/SW

4. **Connecting & Traversing Streets, Minor** – These roadways are typically located in urban settings and include retail and office uses. The streetlighting should provide ambient lighting to sidewalks and building facades. These streets typically have the Twin-Twenty and Washington Globe luminaires.

   Examples: C St NW, 21st through 18th Streets NW, 10th St NW, 6th St NW

5. **Nationally Significant Open Space Streets, Major** – These roadways are adjacent to or within symbolic and ceremonial parks and open spaces. The streetlighting distribution should provide lighting on the roadway surface, sidewalks and the immediately adjacent open spaces. Luminaire uplight and glare should be minimized as to not detract attention from the surrounding spaces. These streets typically have the Twin-Twenty and Washington Globe luminaires.

   Examples: 23rd, 17th, 15th, 14th, 7th, 3rd, 1st Streets NW/SW; 1st NE (beyond Constitution Avenue), 4th Streets (between Constitution and Independence Avenues)

6. **Nationally Significant Open Space Streets, Minor** – These roadways are adjacent to or within symbolic and ceremonial spaces. The streetlighting distribution should provide lighting on the roadway surface and sidewalks. The streetlighting should illuminate the roadways and sidewalks, but spill lighting should be kept to a minimum. Luminaire uplight and glare should be minimized as to not detract attention from the surrounding spaces. These streets typically have the Twin-Twenty, Washington Globe or Olmsted luminaire.

   Examples: Jefferson and Madison Drives; 12th

7. **Waterfront Roadway, Commercial** – Waterfront roadways which include commercial and retail spaces. The streetlighting should illuminate the roadways, sidewalks. Streetlight illumination of adjacent building facades and the waterfront should be balanced with environmental concerns such as protecting the night sky and migratory birds. Luminaires in these areas should be dimmed to match the environmentally sensitive area light levels after hours.

   Examples: Rock Creek Parkway (at Kennedy Center); Maine Ave SW (at the Wharf) [1]

[1] Some private roads are not under federal or DDOT control. For example, the Navy Yard and the Wharf contain private roads regulated by DCRA.

8. **Waterfront Roadway, Environmentally Sensitive** – There are many roadways along the waterfront in and around the monumental core. The streetlighting should illuminate the roadways and sidewalks, but spill lighting should be kept to a minimum. Luminaire uplight and glare should be minimized as to not detract attention from the surrounding spaces, cause light pollution to the surrounding environment, or interfere with wildlife habitats, lifecycles, and activities such as foraging.

   Examples: Ohio Drive SW, East/West Basin Drives, Buckeye Drive SW, and Anacostia Drive SE

9. **Waterfront Pedestrian Walkways** – Pedestrian walkways, adjacent to bodies of water, should illuminate the walkway while minimizing the amount of spill lighting. Luminaire uplight and glare should be minimized as to not detract attention from the surrounding spaces, cause light pollution to the surrounding environment, or interfere with wildlife habitats, lifecycles, and activities such as foraging.

   Examples: Walkways within Constitutional Gardens Pond

10. **Residential** – These local roadways are set within residential housing use areas. These roadways are under the jurisdiction of DDOT. The streetlighting should illuminate the roadways and sidewalks, but spill lighting should be kept to a minimum. Luminaire uplight and glare should be minimized as to not detract attention from the surrounding spaces.

11. **Pedestrian Walkways** – Pedestrian walkways require enough light for pedestrians to navigate comfortably without distracting from the impressive views of the surrounding areas. The lighting along pathways, and trails within squares, parks, and open spaces should illuminate the walkway and the vertical plane at facial height parallel to the walkway.

    Examples: These criteria may be used at the discretion of park and building administrators for pedestrian walkways interior to parks and open spaces such as the walkways flanking the Reflecting Pool, in the Earth Day Park along 9th Street between Independence and C Street SW, and in John Marshall Park.

12. **Pedestrian Underpass** – Pedestrian underpasses require more stringent lighting criteria to enhance security and provide for facial recognition. The lighting should illuminate the walkway, but spill lighting should be kept to a minimum. Luminaire glare should be minimized as to not detract attention from the surrounding spaces.

    Examples: Maine Avenue SW pedestrian underpass; the railroad bridge underpasses on 7th, 6th, 4th, 3rd, and 2nd Streets, SW; the 10th street underpass between D Street and Frontage Rd SW.

13. **Alleys** – The narrow spaces between buildings can make drivers and pedestrians uncomfortable with their surroundings. Providing adequate lighting will improve the feeling of safety and

security. The streetlighting for alleys should focus the light on the roadway/walkway surface. Care should be taken to minimize spill light into adjacent buildings and eliminate uplight.

14. **Intersections** – Intersections are the roadway areas with the highest likelihood for vehicular/vehicular or vehicular/pedestrian conflicts. They require light levels that exceed the adjacent roadways to draw attention to the potential conflicts. The streetlighting should illuminate the roadways, sidewalks, and crosswalks.

    Examples: Where roadways (and pedestrian crossings) intersect.

    a. Average Illuminance: Intersections shall have an illumination average of the sum of the intersecting roadways. For example, two intermediate Principal Arterial Avenues would require an average illumination level of 2.40 – 2.88fc. An intermediate Principal Arterial Avenue intersecting with a residential Minor Arterial would require an average illumination level of 1.90 – 2.28fc. [2]

    b. Uniformity: An intersection shall have a uniformity equal to the lowest uniformity of all of the connecting streets. For example, a Principal Arterial intersecting with a Collector shall have a uniformity less than or equal to 3.0:1.

15. **Mid-Block Crossings –** Crosswalks crossing roadways that are not located at intersections can be more dangerous for pedestrians because drivers may not expect them to be there. Horizontal illuminance to light the crosswalk as well as vertical illuminance to light the pedestrians should be considered. Vertical calculations should be done directed against the driving direction to ensure pedestrian faces will be lit with positive contrast and not appear as silhouettes which are more difficult to see.

16. **Parking Lot –** These parking lots are typically administered by NPS and located in areas with medium/low pedestrian traffic. Many of these parking lots are located within nationally significant open spaces. The streetlighting should illuminate the pavement with sufficient uniformity to minimize significant shadowed areas, providing public safety and security for pedestrians seeking their vehicles. Streetlighting in these areas should ensure excellent color rendition, limit light pollution, and not detract from views and vistas to important monuments, memorials, or civic buildings.

    Examples: Tidal Basin Parking Area, President's Park Parking Area, RFK Stadium lots.

17. **Central Mall Panel/ Viewshed Area** – The area of the National Mall including the central Mall panels and viewshed west of the US Capitol building (located between the pedestrian mid-block crossings at 3rd, 4th, 7th, 14th, 15th, and 17th Streets) is of historic national significance and shall remain open and clear of obstructions. Therefore, the roadways which intersect this protected viewshed shall be omitted when analyzed for roadway lighting. However, pedestrian crosswalks shall be illuminated to ensure safety within this area based on the following recommendations:

[2] The Average Maintained Illuminance range is based on roadway administration, site, and design conditions. See Design Priorities for additional guidance.

A. **Improve nighttime pedestrian safety while retaining the civic, monumental, and historic character of the National Mall:** Additional lighting may be added adjacent to the National Mall panel crosswalks to improve nighttime safety and visibility for drivers, bicyclists, and pedestrians. Improvements should focus light only onto crosswalks - not adjacent roadways - to preserve the existing low light level within the central Mall panel, which is the primary vista west of the US Capitol building. The existing low light level is important to conveying the civic, monumental, and historic character of the National Mall and retaining its complementary relationship to nationally iconic structures, which reinforces a dignified expression of the federal city. Therefore, any additional lighting on the National Mall should have low ambient light levels to support a dark backdrop for highlighted monuments, memorials, and civic buildings.

B. **Minimize crosswalk lighting impacts on viewsheds:** The scale, character, and placement of any additional crosswalk lighting shall minimally impact viewsheds and the pedestrian experience during day and night. Therefore, the placement of any additional crosswalk lighting fixtures should align with existing light fixtures for a continuous row of lights flanking both edges of the center panel. Additional lights should not intrude into the center panel area within the primary vista west of the US Capitol building. The height of any additional crosswalk lighting fixtures should be proportionate to pedestrians and similar to historic light fixtures (particularly the Olmsted fixtures which are 24 feet high and 22 feet to height of light source).

C. **Crosswalk lighting fixtures should be compatible with historic character:** Any additional lighting for crosswalk illumination should be consistent with historic street and pedestrian lights including Washington Globe, Twin-Twenty, and Olmsted fixtures. Any compatible high-performance fixture should achieve ground level illuminance equal to or better than historic light fixtures.

D. **Focus crosswalk light downward to protect environmental and cultural resources:** Any additional lighting for crosswalk illumination should focus light primarily downward to improve nighttime safety while minimizing up-light and glare. Up-light negatively impacts the night sky. Glare negatively impacts the National Mall's nighttime character and viewsheds, as well as driver, bicyclist, and pedestrian visibility.

Table 1: Streetscape and Special Lighting Fixture Area Criteria

Number / Letter	Streetscape and Special Lighting Fixture Area Classification	Color Temperature (See Note 1)	CRI	Distribution	Max BUG rating (See Note 2)
1. a.	Pennsylvania Ave Style	3000K	≥ 80	III, V	B3-U4-G3
1. b.	Capitol Square Walkway Style	4000K	≥ 80	III	B2-U3-G2 (*)
1. c.	Kutz Bridge Style	3000K	≥ 80	III	B3-U4-G3
1. d.	10th Street/L'Enfant Style	3000K	≥ 80	III, V	B3-U4-G3
2.	Radiating & Edging Streets	3000K	≥ 80	III, V	B3-U4-G3
3.	Connecting & Traversing Streets, Major	3000K	≥ 80	III, V	B3-U4-G3
4.	Connecting & Traversing Streets, Minor	2700K	≥ 80	III, V	B2-U3-G3 (*)
5.	Nationally Significant Open Space Streets, Major	3000K	≥ 80	III, V	B2-U3-G3 (*)
6.	Nationally Significant Open Space Streets, Minor	2700K	≥ 80	III (^)	B1-U3-G2 (*)
7.	Waterfront Roadway, Commercial	2700K	≥ 80	V	B2-U3-G3 (*)
8.	Waterfront Roadway, Environmentally Sensitive	2700K	≥ 80	III	B2-U3-G3 (*)
9.	Waterfront Pedestrian Walkways	2700K	≥ 80	III (^)	B1-U3-G2 (*)
10.	Residential	2700K	≥ 80	II, III	B1-U3-G2 (*)
11.	Pedestrian Walkways	2700K	≥ 80	III (^)	B1-U3-G2 (*)
12.	Pedestrian Underpass	2700K	≥ 80	II, III, IV	B1-U3-G2 (*)
13.	Alleys	2700K	≥ 80	II, III, IV	B1-U3-G2 (*)

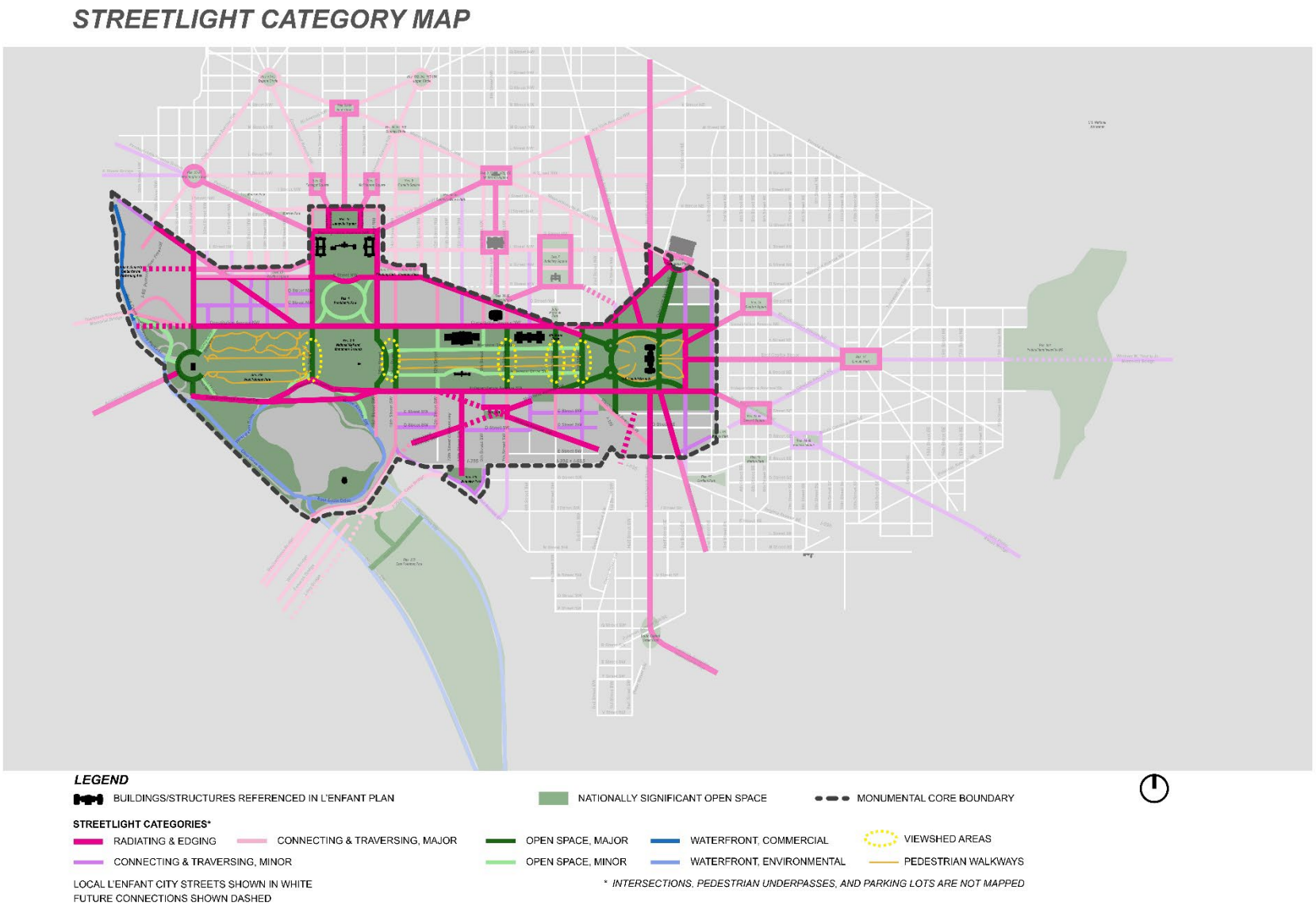
* Maximum values of UH and UL combined must not exceed 600 lumens. See Table 2-2 for more information on U-rating lumen values.

^ with House Side Shield

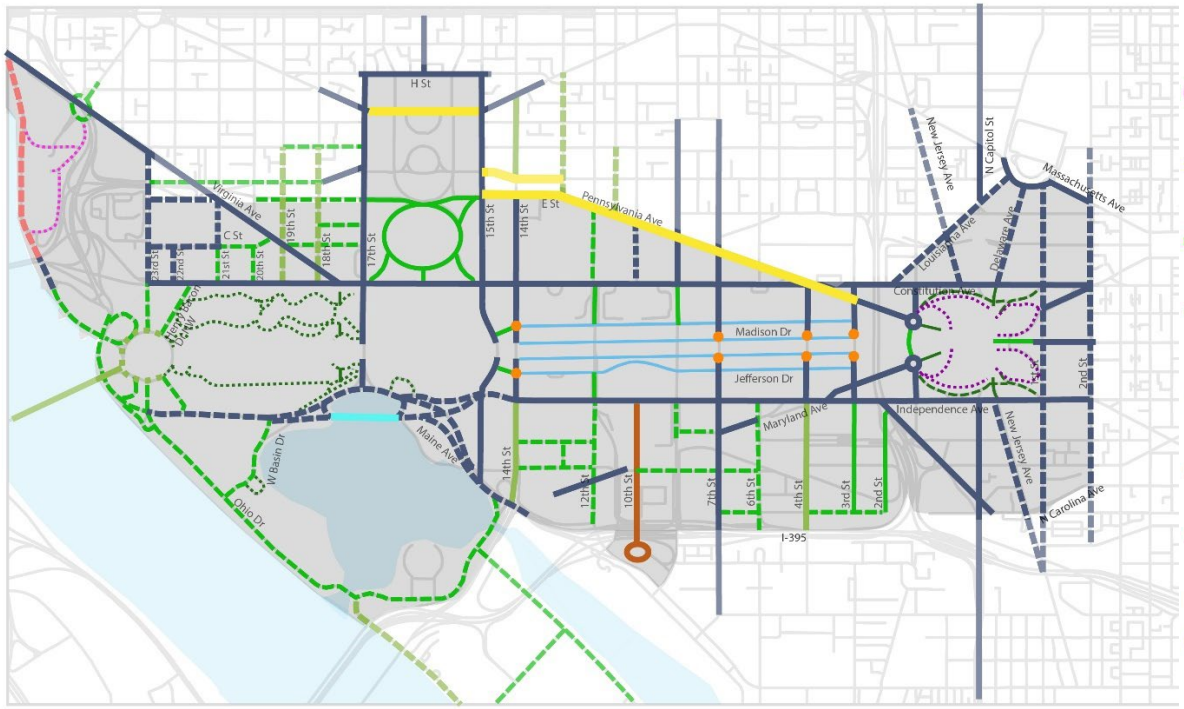
Notes:

1. Streetscape and Special Lighting Fixture Area Classifications shall apply to all areas within the monumental core. Classifications listed may fall under DDOT jurisdiction. If area classification of interest is under DDOT jurisdiction, designer shall utilize DDOT's Roadway Classification Map to identify additional classifications. Areas classified as collector and below shall utilize a 2700K color temperature while areas classified as principal or minor arterial shall utilize a 3000K color temperature. All residential areas shall utilize a 2700K color temperature regardless of classification on DDOT's Roadway Classification Map.
2. The Max BUG rating shall apply to all areas within the monumental core. In locations where DDOT has maintenance jurisdiction within the monumental core, the designer shall confirm with the basis-of-design luminaire manufacturer that the total uplight lumen levels (UH + UL) are less than 10% of the total output lumens. Designer shall utilize whichever criteria is more restrictive.
3. Following the completion of the DDOT's Smart Street Lighting Project (anticipated completion of 2024), this document "Federal LED Streetlight Performance Criteria" shall take precedence and all lighting within the monumental core, regardless of ownership and maintenance jurisdiction, shall be designed to these guidelines.

Map 1: Streetscape Classifications



Map 2: Streetlight Fixtures



MAP 3: STREET LIGHTING PLAN

Streetlight Fixture	Height*	Configuration
Capitol Square Ladder Rest Globe	13 ft	1-Sided
Washington Globe	18 ft	Opposite Staggered 1-Sided
Washington Globe	16 ft	Opposite Staggered
Washington Globe (historic areas)	14 ft	Opposite Staggered 1-Sided
Twin-Twenty** (including State Dept)	20 ft	Opposite Staggered
Olmsted	24 ft	Opposite
Kutz Bridge Saratoga	19 ft	Opposite
10th Street, SW (L'Enfant Promenade)	20 ft	Opposite
Penn Ave Cobrahead Penn Ave Pedestrian Penn Ave Eagle Globe	40 ft 8' – 6" 16 ft	Opposite Opposite Opposite
Kennedy Ctr Post Top Kennedy Ctr Pedestrian	30 ft 12 ft	1-Sided 1-Sided
Cobrahead	30 ft	Staggered
Crosswalk Fixture (See Recommendations)	TBD	Placed at Crosswalks (See Recommendations)

Streetlight Illumination Criteria:

The streetlight illumination levels are based on the roadway classification and nighttime pedestrian volumes. Classifications and volumes can be found on the Roadway Classification Map and Nighttime Pedestrian Volumes map below. Average maintained illuminance for R3 asphalt road surfaces and uniformity levels can be found in the table below. The design criteria are based on AASHTO's design guide. For the purposes of this guide, pedestrian activity has been defined as the following:

High Pedestrian Activity Areas: Commercial areas in urban environments with significant retail spaces or other public gathering spaces that draw pedestrian traffic of 100 or more pedestrians per hour (Average annual nighttime pedestrian volume).

Medium Pedestrian Activity: Intermediate areas including those near community facilities such as libraries and recreation centers., and mixed-use facilities which draw pedestrian volumes between 11-99 pedestrians per hour (Average annual nighttime pedestrian volume)

Low Pedestrian Activity Areas: Residential areas with single-family homes and low-density residential developments. These areas draw pedestrian traffic of 10 or fewer pedestrians per hour (Average annual nighttime pedestrian volume).

Table 2: Streetlight Illumination

Roadway Classification	Off-Roadway Light Sources (Pedestrian Level)	Average Maintained Illuminance (fc)	Uniformity Ratio (Avg/min)
Principal Arterials	Commercial (High)	1.60 – 1.92	3.0:1 or less
	Intermediate (Medium)	1.20 – 1.44	3.0:1 or less
	Residential (Low)	0.80 – 0.96	3.0:1 or less
Minor Arterials	Commercial (High)	1.40 – 1.68	4.0:1 or less
	Intermediate (Medium)	1.00 – 1.20	4.0:1 or less
	Residential (Low)	0.70 – 0.84	4.0:1 or less
Collectors	Commercial (High)	1.10 – 1.32	4.0:1 or less
	Intermediate (Medium)	0.80 – 0.96	4.0:1 or less
	Residential (Low)	0.60 – 0.72	4.0:1 or less
Local	Commercial (High)	0.80 – 0.96	6.0:1 or less
	Intermediate (Medium)	0.70 – 0.84	6.0:1 or less
	Residential (Low)	0.40 – 0.48	6.0:1 or less
Alleys	Commercial (High)	0.60 – 0.72	6.0:1 or less
	Intermediate (Medium)	0.40 – 0.48	6.0:1 or less
	Residential (Low)	0.30 – 0.36	6.0:1 or less
Intersections	Reference Streetscape Classifications, Section 14		

Table 3: Walkway and Sidewalk Illumination

Walkways and Sidewalks	Average Horizontal Illuminance (fc)	Avg Vertical Illuminance @ 5' AFG (fc)	Uniformity Ratio (Avg/Min)
Midblock Crosswalk	Equal to Roadway Criteria	Equal to Horizontal Illuminance Criteria	Equal to Roadway Criteria
Pedestrian Walkway	1.00 – 1.20	0.20	4.0:1 or less
Pedestrian Walkway (Waterfront)	0.50 – 0.60	0.10	4.0:1 or less
Pedestrian Walkway (National Mall)	0.50 – 0.60	0.10	4.0:1 or less
Sidewalk (High Pedestrian Activity) *	0.90	-	-
Sidewalk (Medium Pedestrian Activity) *	0.60	-	-
Sidewalk (Low Pedestrian Activity) *	0.30	-	-

* Not required to be higher than roadway average.

Table 4: Parking Lot Illumination

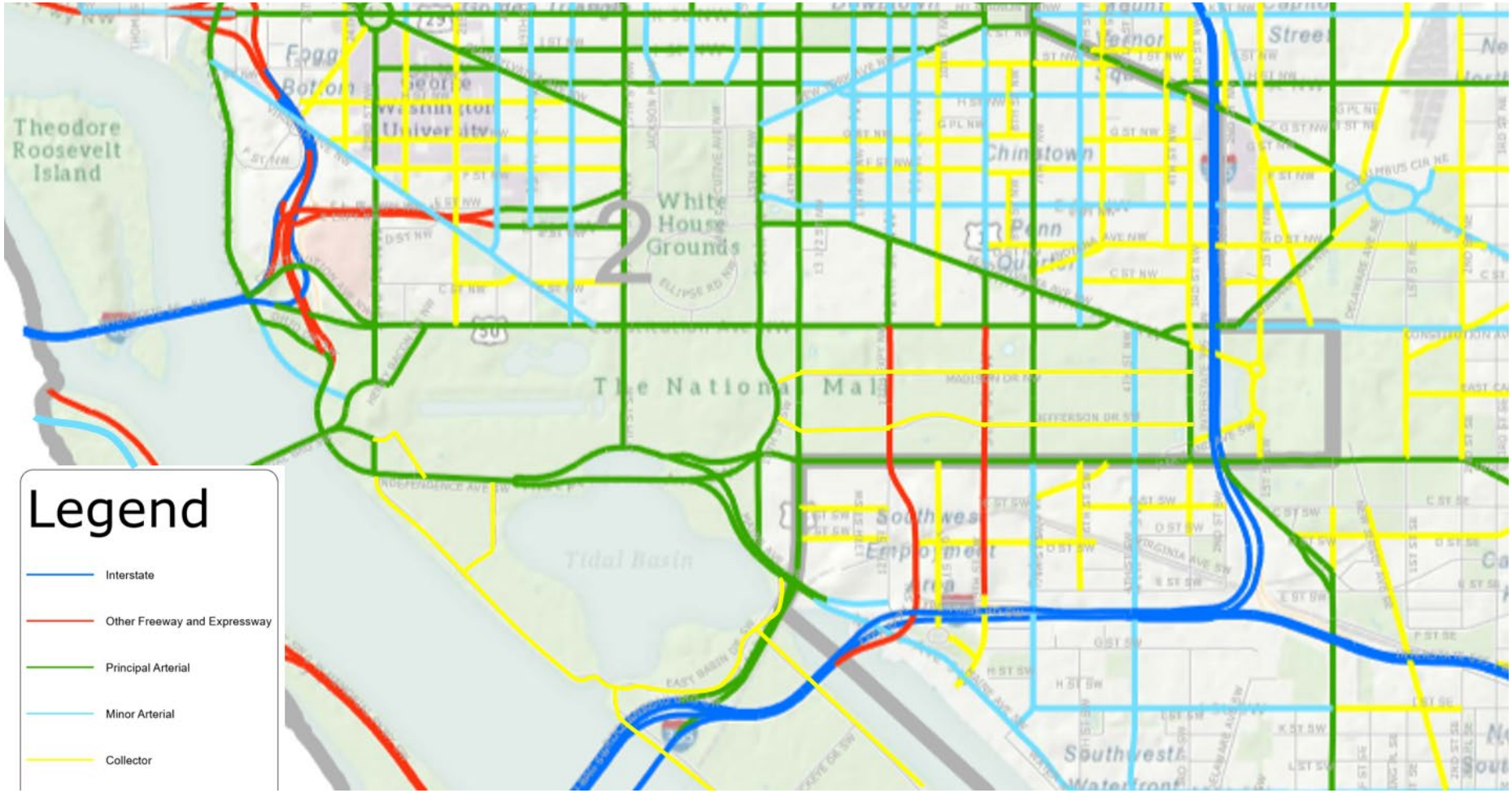
Parking Lot Illumination	Avg Horizontal Illuminance (fc)	Min Horizontal Illuminance (fc)	Min Vertical Illuminance @ 5' AFG (fc)	Uniformity Ratio (Max/Min)
Parking Lot	0.90-1.10	0.20	0.10	15.0:1 or less

Design Priorities

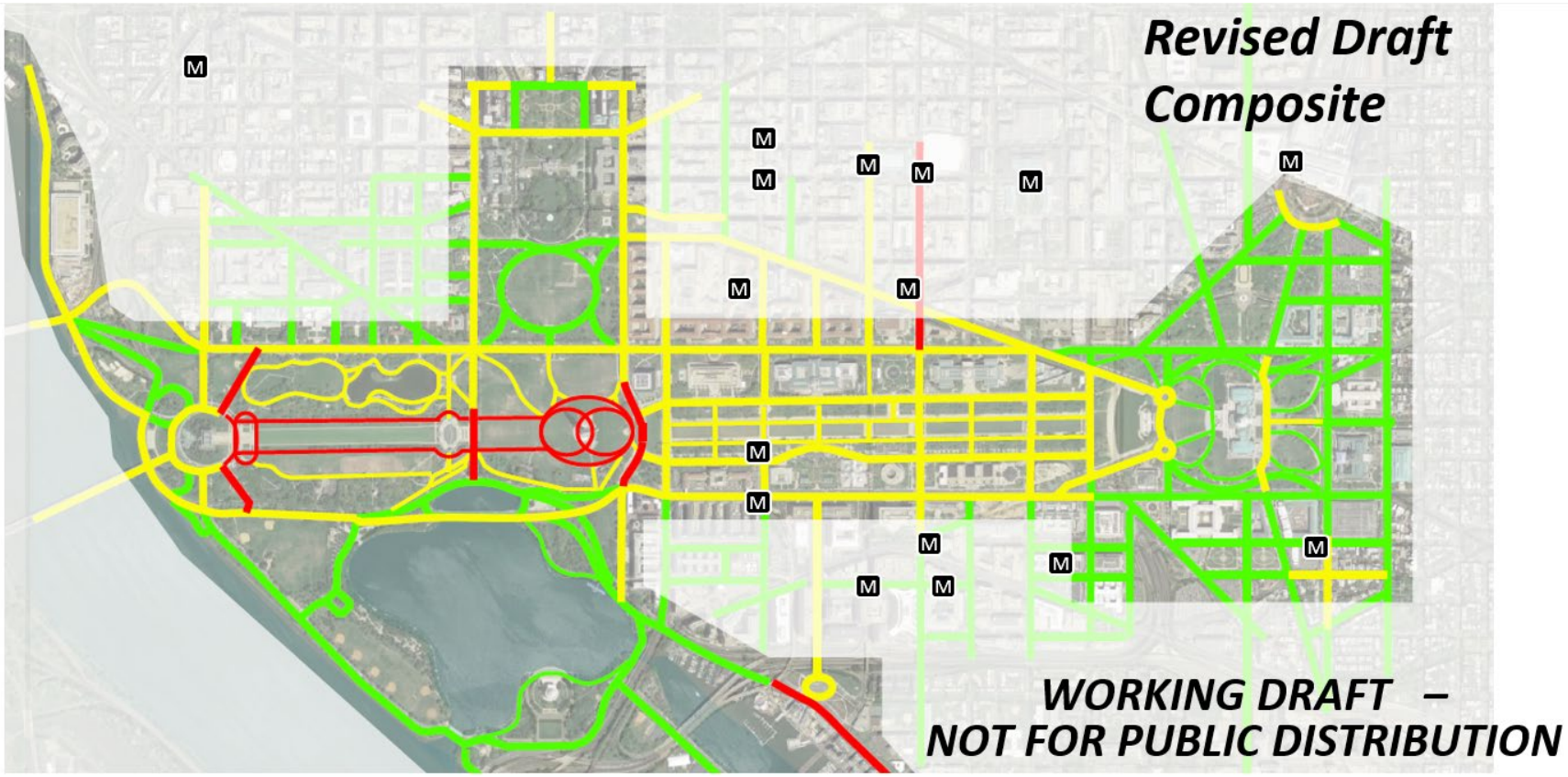
If existing conditions or project scope limitations prevent the proposed design from meeting all design criteria, the following is list of design criteria in priority order:

1. Streetlight Lighting Criteria: Average Maintained Illuminance (Mid-Block Crosswalk)
2. Streetlight Lighting Criteria: Average Maintained Illuminance (Intersections)
3. Streetlight Lighting Criteria: Average Maintained Illuminance (Roadway)
4. Streetlight Lighting Criteria: Average Maintained Illuminance (Sidewalk)
5. Streetlight Lighting Criteria: Average Maintained Illuminance (Walkway)
6. Streetlight Lighting Criteria: Uniformity Ratio (Mid-Block Crosswalk)
7. Streetlight Lighting Criteria: Uniformity Ratio (Intersections)
8. Streetlight Lighting Criteria: Uniformity Ratio (Roadway)
9. Streetlight Lighting Criteria: Uniformity Ratio (Sidewalk)
10. Streetlight Lighting Criteria: Uniformity Ratio (Walkway)
11. Streetlight Lighting Criteria: Average Vertical Illuminance
12. Streetscape Criteria: BUG Rating
13. Streetscape Criteria: Color Temperature
14. Streetscape Criteria: CRI
15. Streetscape Criteria: Distribution

Map 3: Roadway Classifications



Map 4: Nighttime Pedestrian Volumes



Streetlight Design Implementation:

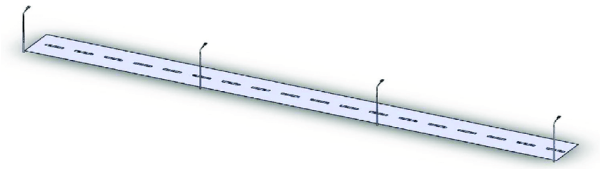
This section addresses the proper procedure and protocol for implementing the LED Streetlight Performance Criteria.

Color Rendering: Lighting should provide accurate color rendition and information about the walking/driving surface, surroundings, and people, vehicles, and animals moving within the area. Streetlights within the monumental core should have a minimum CRI of 80.

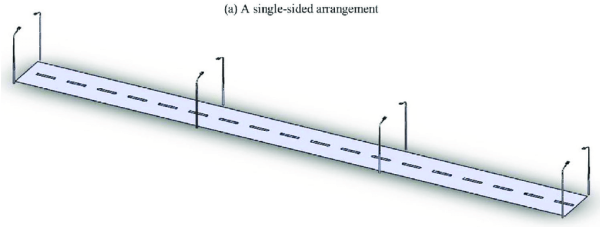
Color Temperature: The color temperature of a light source can have a significant effect on the surrounding environment. Light sources with color temperatures above 3,500K can interrupt the circadian rhythms of people and interfere with the habits of wildlife and growth cycles of trees and plants. Luminaires selected for roadways with higher traffic volumes should have a CCT of 3,000K (±100K). Roadways with lower traffic volumes, pedestrian walkways, underpasses, and environmentally sensitive waterfront areas should have a CCT of 2,700K (±100K).

Glare: Streetlight luminaires with high luminance or high angles of distribution can cause discomfort and even disability to drivers and pedestrians. Luminance of the selected post-top luminaires should be reduced to the minimum value possible, while still meeting lighting design criteria. In certain settings, internal shielding may be used to reduce high incident angles of the lighting distribution.

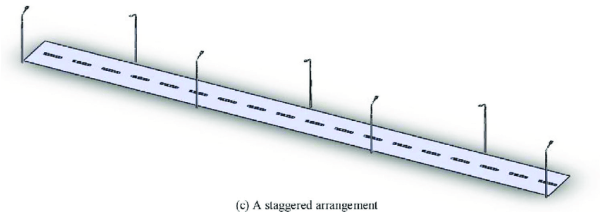
Light Pole Configuration: Luminaires shall be spaced evenly, where possible, in order to create a uniform aesthetic. Light poles shall be arranged in one of three different configurations; 1-sided. opposite, and staggered. Examples of the different configurations can be seen in the image below.



(a) A single-sided arrangement



(b) An opposite arrangement



(c) A staggered arrangement

Luminaire appearance: The luminaires selected as replacements should have a light source with an inconspicuous appearance within the luminaire. In globe luminaires, the light source should appear as an evenly round floating orb shining within the center of the globe. The light source should not look facetted, non-uniform, comprised of multiple components, or out of plumb. The top of the globe (where some finials attach) should be only partially illuminated so that the globe silhouette is visible. To limit up-light in the globe fixtures, internal shielding should be graduated or perforated to diffuse light and to prevent the appearance of a horizontal cutoff line as viewed from outside the lens.

Post-Construction Field Testing for Luminance Appearance: After the installation is complete, a field evaluation shall be conducted to determine if the light levels require adjustment to achieve the desired luminance hierarchy between the monuments, memorials, civic buildings, federal bridges and the streets.

Pre-Construction Field Testing for Luminaire Appearance: In order to ensure the LED luminaires achieve the desired character to match the surrounding streetscape, an initial field mockup (test installation) shall be provided for a minimum of 28 days for each luminaire type (manufacturer, wattage and distribution) to be installed. The luminaires will be evaluated for appearance during the day and when illuminated at night. The testing area should include an entire block (minimum 5 street lighting units).

Spill Lighting: Lighting shall be designed to minimize spill lighting where the design criteria calls for minimizing backlight. Where ambient light levels adjacent to roadways and sidewalks are intended to be minimal, shielding or reflectors shall be used to control spill lighting.

Uniformity: Streetlighting should uniformly illuminate the target surfaces. Typically, the target surface is the roadway, but certain roadway classifications include additional target surfaces such as sidewalks and building facades. Lighting should generally be uniform across ground surfaces, avoiding contrasts between dark and brightly lit areas. Although light uniformity reduces visual acuity by reducing contrast and increasing glare (LED Street Light Research Project 2011), light that grazes surfaces exposes detail about conditions that may affect safety or increase visual detail.

Uplight: Luminaires should minimize uplight to reduce sky glow and prevent light pollution. Many historic luminaires within the Monumental Core do not prevent uplight which causes light pollution into the night sky. The decorative post-top luminaires should contain uplight shields which prevent significant uplight (see Luminaire Appearance for more criteria).

Calculations

This section defines the parameters of the calculations to achieve the criteria listed in each category. The calculations must be submitted to the responsible agency for approval. Calculations shall be performed using Visual Lighting Software (Acuity Brands) or AGi32 (Lighting Analysts). Calculations may be submitted in PDF format.

1. **LLF:** Light loss factor is the combination of the LLD and the LDD. (LLF = LLD X LDD)
    a. **Post-top luminaires:** 0.74
    b. **Tear Drop luminaires:** 0.83
    c. **Cobrahead luminaires:** 0.83
    d. **Wall-mounted or ceiling-mounted luminaires:** 0.78
2. **Grid point spacing:** Different types of calculations require different grid point spacing depending on the accuracy required. Sidewalks adjacent to roadways do not require separate grid points.
    a. **Roadways, Horizontal:** 5’ x 5’
    b. **Intersections:** 5’ x 5’
    c. **Mid-Block Crosswalks, Horizontal:** 5‘ x 5’
    d. **Mid-Block Crosswalks, Vertical:** 1.5’ linearly along the centerline of each lane, facing the oncoming traffic
    e. **Walkways (<8’ wide), Horizontal:** 2’ x 2’
    f. **Walkways (≥8’ wide), Horizontal:** 5’ x 5’
    g. **Walkways, Vertical:** 5’ linearly along the centerline, parallel to the walkway
    h. **Sidewalks:** 2’ x 2’
    i. **Parking Lots, Horizontal:** 10’ x 10’
    j. **Parking Lots, Vertical:** 5’ linearly along the centerline of each lane, facing the direction of travel (may require two opposite facing points)
3. **Calculation Precision:** Calculations for average and minimum illuminance should be performed to the nearest hundredth (0.00). Calculations for uniformity should be performed to the nearest tenth (0.0).
4. **Calculation Area:** The calculation points should cover the areas as described below:
    a. **Roadways, Horizontal:** Edge of pavement. Stop line to stop line.
    b. **Intersection:** Curb to Curb, from the stop line of each branch.
    c. **Mid-Block Crosswalks:** Center of striping, curb to curb.
    d. **Walkways (<8’ wide), Horizontal:** Edge of pavement.
    e. **Walkways (≥8’ wide), Horizontal:** Edge of pavement.
    f. **Walkways, Vertical:** Centerline of walkway, curb to curb.
    g. **Sidewalks:** Edge of pavement.
    h. **Parking Lots, Horizontal:** Edge of pavement.
    i. **Parking Lots, Vertical:** Travel lane