APPENDIX D

Lighting Memorandum

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June 1, 2017

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Re: Sunset Strip Off-Site Signage Policy
West Hollywood, California

Dear Eric:

Francis Krahe & Associates Inc. is pleased to present the following analysis and recommendations with respect to the proposed Sunset Strip Sign Off Site Sign Policy. The enclosed report includes a summary of recommendations with respect to the illumination of signs, analysis of the parameters that affect Light Trespass or Glare at adjacent properties or public rights of way, review of pertinent lighting regulations and the best practices for lighting design, and recommended significance thresholds with respect to off-site illuminated signs.

This analysis presents two key recommendations:

1. Regulate the sign illuminance at the adjacent sensitive use property line in a manner consistent with the California Energy Code (CEC) outdoor lighting zones at maximum of 1.4 footcandles.

   The Light Trespass illuminance limit of 1.4 footcandles ensures the illuminated signs will not adversely impact adjacent sensitive use sites. Illuminance from the sign decreases in proportion to the inverse square of the distance. Therefore, more distant sensitive site locations will receive significantly less light from the signs, and will not be impacted by the sign illuminance.

2. Limit sign luminance to 300 cd/m^2 to minimize Glare by reducing the luminance to less than a 50 to 1 contrast ratio to the ambient luminance along the Sunset Strip.

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The maximum sign luminance of 300 cd/m^2 ensures the signs will not be overly bright and will not cause high contrast or disability glare conditions at night. This luminance limit will reduce the contrast of the signs well below the California Vehicle Code regulations (82% below the maximum allowable 500 fL). This limit will ensure driver and pedestrian safety along the Sunset Strip.

3. The IESNA lists multiple visual factors which affect human cognitive recognition of visual signals, including the brightness of the source, size of the image, and the rate of change in the brightness. High contrast signs may increase driver distraction by elevating the prominence of these signs above traffic signals or other critical roadway information. Limiting sign luminance to result in medium contrast will increase the safety for drivers by ensuring the most critical traffic information will be the most prominent within the field of view.

Please advise if we may provide any further clarification to the information enclosed.

Best regards,

FRANCIS KRAHE & ASSOCIATES INC.

Francis J. Krahe II, *PE*

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SUNSET STRIP OFF-SITE SIGNAGE POLICY LIGHTING REPORT

Prepared for: the City of West Hollywood
Dudek & Associates

May 26, 2017

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Francis Krahe & Associates Inc. is pleased to present the following analysis of lighting for the proposed Sunset Strip Off-Site Signage Policy as follows:

- Recommendations for illuminated signs with the Sunset Strip Off-Site Signage Policy.
- Analysis of the parameters that affect Light Trespass or Glare at adjacent properties or public rights of way in the vicinity of the proposed sign district.
- Review of pertinent lighting regulations, and the best practices for lighting design recommended by the Illuminating Engineering Society of North America (IESNA) and other agencies.
- Discussion of significance thresholds with respect to off-site illuminated signs.

1. Recommendations

The following issues should be addressed in the West Hollywood Sunset Strip Sign District to facilitate an appropriate process of submittal, review, and approval for new or converted illuminated signs.

Lighting impact issues are focused around two key subjects: Light Trespass and Glare.

- *Light Trespass*[1] is the light that falls on a property but originates on an adjacent property. Light Trespass is measured in terms of illuminance (foot-candles or metric units lux), and can be measured at any point and at in any direction. Where Light Trespass is evaluated the illuminance is measured perpendicular to the source of light, toward the source of light, at the property line, or the location where light is causing an issue, such as a residential window or balcony.

- *Glare*[2] occurs when either the luminance is too high or the range of brightness in a visual field is too large. A bright light source, such as a flood light or street light, viewed against a dark sky may be uncomfortable to look at, and may create a temporary sensation of blindness, which is referred to as disability glare. Glare is evaluated by measuring the luminance (footlamberts or metric units candelas/m^2) at the source of light, such as a digital display, in comparison to the surrounding adjacent luminance. The term which describes the extent of Glare at an observer position for a view is referred to as contrast, and is determined by the variation of luminance within the field of view. "High," "Medium," and "Low" contrast are terms used to describe contrast ratios. The ratio of peak measured luminance to the average within a field of view: contrast ratios greater than 30:1, between 10:1 and 30:1, and below 10:1, respectively. Contrast ratios above 30:1 are generally uncomfortable for the human eye to perceive. Any source luminance that is

[1] *IESNA Handbook, 10th Edition, 19.3: Light Pollution and Trespass, page 19.7*

[2] *IESNA Handbook, 10th Edition, 4.10: Glare, page 4.25*

more than 50 times the adjacent background will be viewed as prominent, and may be viewed as distracting.

Illumination limits should be clearly stipulated in the Sign District regulations to prevent signs that create excessive Light Trespass and/or Glare, to allow the illuminated sign conversions to be evaluated efficiently, and provide a consistent lighting performance standard for property owners, applicants, and the general public. Currently there is no regulation of these lighting factors within the City of West Hollywood Municipal code. Clear standards would improve the operations for digital off-site signage process for all parties.

The IESNA lists multiple visual factors[3] which affect human cognitive recognition of visual signals, including the brightness of the source, size of the image, and the rate of change in the brightness. High contrast signs may increase driver distraction by elevating the prominence of these signs above traffic signals or other critical roadway information. Limiting sign luminance to result in medium contrast will increase the safety for drivers by ensuring the most critical traffic information will be the most prominent within the field of view.

1.1 West Hollywood Lighting Regulations

We recommend the City develop new lighting standards within the Sign District regulations to limit Light Trespass and Glare consistent with the current State and National standards. These State and National standards are designed to limit light pollution and off site lighting effects.

Reference standards include the California Energy Code (CalGreen), ASHRAE 90-75, the U.S. Green Building Council, and model lighting ordinances provided by the Illuminating Engineering Society of North America (IESNA) and the International Dark Sky Organization. Various aspects of these standards are included in local regulations to improve the outcomes of any approved project and avoid future disputes or legal challenges to proposed lighting plans. Standards suggested below will allow sufficient sign brightness and flexibility for the sign owners and advertisers, while minimizing the off-site negative effects of Light Trespass and Glare.

1.2 Lighting Zone Designation LZ 4

The Sunset Strip is an existing urban commercial zone with extensive nighttime use, including restaurants, entertainment, and outdoor advertising. Current best practices for lighting standards recognize the unique issues related to areas of high volume night time use versus areas where the primary use is residential. The California Energy Code (CEC) includes designations for Lighting Zones (LZ) 1 through 4 , included below in Appendix A, which correspond to the Light Trespass recommendations within the IESNA 10th Edition Handbook, Table 26.4, included in Appendix B.

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[3] *IESNA Handbook, 10th Edition, 4.2: Basic Parameters, page 4.4*

All urban areas within California are designated Lighting Zone 3 as default under the CEC, which limits the Light Trespass to 8 lux (0.74 footcandles). Per the CEC, California Building Energy Efficiency Standards, Section 10-114, page 40, 41., the designations for outdoor lighting zones in urban areas are as follows:

"The default for urban areas, as defined by the U.S. Census Bureau, is Lighting Zone 3. Local AHJs (Authorities Having Jurisdiction) may designate areas to Lighting Zone 4 for high intensity nighttime use, such as entertainment or commercial districts or areas with special security considerations requiring very high light levels."

CEC Lighting Zone 4 allows higher illuminance for Light Trespass for building and illuminated signs in areas of High Ambient Lighting, defined by the IESNA as "areas of human activity where the vision of human residents and users is adapted to high light levels. Lighting is generally considered necessary for safety, security and/or convenience and it is mostly uniform or continuous." We recommend the City of West Hollywood designate the Sunset Strip District to be Lighting Zone 4 to allow higher illuminance values for Light Trespass under the CEC standards, which apply to all exterior lighting for building and illuminated signs.

Procedures for lighting zone designation changes are summarized in CEC Section 10-114 – DETERMINATION OF OUTDOOR LIGHTING ZONES AND ADMINISTRATIVE RULES FOR USE, which stipulates the local jurisdiction may implement changes to the Lighting Zone Designation as follows:

"(c) Amending the Lighting Zone Designation. A local jurisdiction may officially adopt changes to the lighting zone designation of an area by following a public process that allows for formal public notification, review, and comment about the proposed change. The local jurisdiction may determine areas where Lighting Zone 4 is applicable and may increase or decrease the lighting zones for areas that are in State Default Lighting Zones 1, 2 and 3, as specified in TABLE 10-114-A.

(d) Commission Notification, Amended Outdoor Lighting Zone Designation. Local jurisdictions who adopt changes to the State Default Lighting Zones shall notify the Commission by providing the following materials to the Executive Director:

1. A detailed specification of the boundaries of the adopted Lighting Zones, consisting of the county name, the city name if any, the zip code(s) of the re designated areas, and a description of the physical boundaries within each zip code;

2. A description of the public process that was conducted in adopting the Lighting Zone changes; and

3. An explanation of how the adopted Lighting Zone changes are consistent with the specifications of Section 10-114.

(e) The Commission shall have the authority to not allow Lighting Zone changes which the Commission finds to be inconsistent with the specifications of Section 10-114."

By comparison, the Los Angeles Municipal Code (LAMC) defines a substantially higher Sign Illuminance Light Trespass maximum of 32.3 lux (3.0 footcandles) versus the CEC standards for Zone 3 or 4 (see section 2.2 below). The LAMC is 4 times higher than the CEC Zone 3 Light Trespass and 2.14 times higher than the Lighting Zone 4. While the LZ4 value is much less than the current LAMC maximum, the CEC standard is well defined and supported by the IESNA and ASHRAE, and other independent lighting organizations such as the International Dark Sky Organization and U.S. Green Building Council.

2. Analysis of Sunset Strip Lighting

The development of the lighting regulations noted above is recommended based upon an evaluation of the existing conditions along the Sunset Strip, the proposed conversion of a portion of the existing illuminated sign billboards to digital illuminated signs, and the proposed addition of new illuminated signs at selected sites along the Sunset Strip.

2.1 Existing Lighting Conditions

The existing lighting conditions along the Sunset Strip include a variety of light sources which contribute to a brightly illuminated outdoor urban environment. The streets and sidewalks along the Sunset Strip have a relatively high illumination consistent with the vehicular design standards for a high volume arterial street. The public right of way is surrounded on both north and south with commercial properties where parking lot lights and exterior building lighting is frequent. Within this well illuminated context, the lighted billboards and signs are prominent, but not excessively bright in comparison to their surroundings.

Residential properties to the north and south along the Sunset Strip are generally set back behind the commercial properties that front onto Sunset. The slope north and south of Sunset significantly affects the visibility of the signs from residential properties. To the north, the residential properties are usually well above the elevation of the Sunset Strip, and in most locations, above the top elevation of the illuminated signs. To the north of Sunset, the ambient light levels at residential streets and properties are very low, therefore the light incident at these residential properties from the signs may be substantial. However, most of the existing illuminated signs are located and directed such that there are few locations where signs project significant Light Trespass or Glare. The distances to adjacent residential properties varies considerably. The properties within close proximity are 250 feet to 300 feet away from the existing signs on the Sunset Strip.

To the south of the Sunset Strip, the residential properties are below the elevation of the Sunset Strip and well below the elevation of the illuminated signs. Signs located on the south side of the Sunset Strip have the potential to create Light Trespass and or Glare due to the difference in elevation. Most of the existing illuminated signs are located and directed such that there are few locations where signs project significant Light Trespass or Glare to adjacent residential properties.

2.2 Future Lighting Conditions

Future proposed signs may cause Light Trespass or Glare with respect to the following variables:

- The sign light source (LED, metal halide lamps, or other technology) projects toward an adjacent property, and is close enough (immediately adjacent to or less than 250 feet away) to create substantial illuminance at a residential property line.
- The sign surface area is large enough to create substantial illuminance at an adjacent residential property line.
- The sign surface is bright enough to create Glare, or high contrast conditions, when the sign surface luminance is compared to the surrounding surface luminance.
- North facing (northeast to northwest) signs from the south side of Sunset Strip may be a source of Glare to residential properties to the north of The Sunset Strip.
- Signs along the south side of Sunset may create Light Trespass illuminance to residential zoned properties down the slope, south of the Sunset Strip, adjacent to or within 250 feet of the sign.

The following regulatory criteria will limit the Light Trespass and Glare impacts of the proposed illuminated signs:

Light Trespass sign illuminance must be less than the LZ4 value of 1.4 footcandles at adjacent residential zoned property lines.

Sign luminance maximum 300 candelas/m^2 will reduce Glare to below high contrast conditions.

The following formula describes the relationship between the Light Trespass illuminance measured in footcandles (*fc*) at any property line, the Sign Luminance (cd/m^2), the Sign Area (ft^2), and the distance (*ft*) from the sign to the property line.

$$Light\ Trespass\ Illuminance\ = \frac{\text{Sign Area x Sign Luminance}}{10.76\ x\ Distance^2}$$

To comply with these regulations, signs will be either greater than 250 feet from a residential use, or reduced sign area, or reduced sign luminance.

3. Review of Lighting Regulations

Exterior lighting for signs is regulated throughout California by the local municipal code and the state energy, building, and vehicle codes. Pertinent lighting sections are summarized and discussed for the City of West Hollywood Municipal Code, the City of Los Angeles Municipal Code, City of Los Angeles Sign Use Districts, the State of California Green Building Code, and State of California Vehicle Code.

3.1 City of West Hollywood Municipal Code

The City of West Hollywood has established various codes and design guidelines that regulate the design of outdoor lighting and signs. Several code sections that regulate outdoor lighting are listed below:

West Hollywood Municipal Code contains guidelines for exterior building lighting and exterior sign illumination as follows:

Sections G-12.040 and G-34.250 define requirements for On Site Signage and Buildings. Because the proposed Sunset Strip Off-Site Signage Policy pertains to off-site signs and Sections G-12.040 and G-34.250 consist of design guidelines for on-site signs, these sections of the Municipal Code to not directly apply to the signs that would be regulated by the proposed project. However, the factors identified in the Municipal Code are pertinent to the evaluation of any potential lighting impact in that the Code stipulates Light Trespass and Glare restrictions.

City of West Hollywood Municipal Code, Section G-12.040 Building Design and Architecture.

6. Lighting.

f. All lighting should be shielded to confine light spread within the site boundaries.

j. Illuminate signs and billboards from above, not below.

City of West Hollywood Municipal Code, Section G-34.250 Sign Illumination.

> Shield the light source. Whenever direct lighting fixtures are used (fluorescent or incandescent), care should be taken to properly shield the light source to prevent Glare from spilling over into residential areas and any public right-of-way. Signs should be lighted only to the minimum level required for nighttime readability.

3.2 Los Angeles Municipal Code

The City of Los Angeles regulates lighting with respect to building and safety, transportation, and Light Trespass (i.e., the spillover of light onto adjacent residential properties). Since the City of West Hollywood does not specify Light Trespass values at the property line of a residential zoned property, the LA Municipal Code is frequently used as the basis of developing a Significance Threshold for a lighting analysis. The following sections of the LA Municipal Code specify limits for exterior lighting:

Exterior lighting, such as streetlights and illuminated signs are regulated by the Los Angeles Municipal Code (LAMC). Applicable regulations include the following:

- LAMC Chapter 1, Article 4.4, Sec. 14.4.4 E. No sign shall be arranged and illuminated in such a manner as to produce a light intensity greater than 3 foot-candles above ambient lighting, as measured at the property line of the nearest residentially zoned property.

3.3 California Code of Regulations, Title 24

Title 24 of the California Code of Regulations (CCR), also known as the California Building Standards Code, consists of regulations to control building standards throughout the State. The following components of Title 24 include standards related to lighting:

California Building Code (Title 24, Part 1) and California Electrical Code (Title 24, Part 3)

The California Building Code (Title 24, Part 1) and the California Electrical Code (Title 24, Part 3) stipulate minimum light intensities for safety and security at pedestrian pathways, circulation ways, and paths of egress. All exterior lighting will comply with the requirements of the California Building Code and California Electrical Code.

California Energy Code (Title 24, Part 6)

The California Energy Code (CEC) stipulates allowances for lighting power and provides lighting control requirements for various lighting systems, including illuminated signs (see Appendix C and D herein), with the aim of reducing energy consumption through efficient and effective use of lighting equipment.

Section 130.3 – SIGN LIGHTING CONTROLS (herein as Appendix E) sets forth requirements for Sign Lighting Controls. All signs must comply with these requirements including a sign ON both and day and night must include a minimum 65 percent dimming at night.

Section 140.8 of the CEC (herein as Appendix F) sets forth lighting power density restrictions for signs.

California Green Building Standards Code (Title 24, Part 11)

The California Green Building Standards Code, which is Part 11 of Title 24, is commonly referred to as the CALGreen Code. Paragraph 5.1106.8, Light pollution reduction, requires that all non-residential outdoor lighting must comply with the following:

- The minimum requirements in the CEC for Lighting Zones 1–4 as defined in Chapter 10 of the California Administrative Code as noted above; and
- Backlight, Uplight and Glare (BUG) ratings as defined in the Illuminating Engineering Society of North America's Technical Memorandum on Luminaire Classification Systems for Outdoor Luminaires identified as IESNA TM-15-07 Addendum A; and
- Allowable BUG ratings not exceeding those shown in Table A5.106.8 in Section 5.106.8[4] of the CALGreen Code (excerpt included in the Appendix H of this Study); or

[4] *Table 5.106.8, Footnote 2 defines the location of the Property Line for the purpose of evaluating compliance with the BUG ratings and provides that: "For property lines that abut public walkways, bikeways, plazas and parking lots, the property line may be considered to be 5 feet beyond the actual property line for purpose of*

- Comply with a local ordinance lawfully enacted pursuant to Section 101.7, whichever is more stringent.

3.4 California Vehicle Code, Division 11. Rules of the Road

Chapter 2, Article 3 of the California Vehicle Code stipulates limits to the location of light sources that may cause glare and impair the vision of drivers.

- ARTICLE 3. Offenses Relating to Traffic Devices [21450 - 21468] (Article 3 enacted by Stats. 1959, Ch. 3.), Section 21466.5. No person shall place or maintain or display, upon or in view of any highway, any light of any color of such brilliance as to impair the vision of drivers upon the highway. A light source shall be considered vision impairing when its brilliance exceeds the values listed below.

  The brightness reading of an objectionable light source shall be measured with a 11/2-degree photoelectric brightness meter placed at the driver's point of view. The maximum measured brightness of the light source within 10 degrees from the driver's normal line of sight shall not be more than 1,000 times the minimum measured brightness in the driver's field of view, except that when the minimum measured brightness in the field of view is 10 foot-lamberts or less, the measured brightness of the light source in foot-lambert shall not exceed 500 plus 100 times the angle, in degrees, between the driver's line of sight and the light source.

Utilizing the proposed limits to sign brightness outlined in Section 2.2 above will ensure the signs are well below the California Vehicle Code requirements. This analysis assumes the worst case, most conservative, condition where the Project signs would be within the centerline of the driver's field of view, and the angle noted above is 0. For this worst case condition the maximum allowable luminance is 500 fL. Therefore the threshold for night luminance is a maximum 500 fL for the California Vehicle code.

In Section 2.2 above, illuminated signs are recommended to not exceed a maximum surface brightness of 300 candelas/m^2. Calculating the equivalent sign luminance by converting to English units from metric units, 300 candelas/m^2 equals 87.6 fL. The illuminated sign brightness will not exceed 87.6 fL, which is far less than the 500 fL maximum. Therefore, at night the illuminated signs will not exceed the 500 fL threshold and will not introduce a new source of glare as defined by the California Vehicle Code, Article 3.

3.5 IESNA Recommended Practices

The Illuminating Engineering Society of North America (IESNA) recommends illumination standards for a wide range of building and development types. These recommendations are widely recognized and accepted as best practices and are therefore a consistent predictor of the type and direction of illumination for any given building type. For all areas not stipulated by the regulatory building code, municipal code or specifically

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determining compliance with this section. For property lines that abut public roadways and public transit corridors, the property line may be considered to be the centerline of the public roadway or public transit corridor for the purpose of determining compliance with this section." See Appendix H.

defined requirements, the IESNA standards are used as the basis for establishing the amount and direction of light for the Project.

The IESNA 10th Edition Lighting Handbook defines Outdoor Lighting Zones relative to a range of human activity versus natural habitat. Table 26.4, Nighttime Outdoor Lighting Zone Definitions, included in Appendix C of this Study, establishes the Zone designation for a range of existing lighting conditions, from low or no existing lighting to high light levels in urban areas. Table 26.4 is referenced by the CEC in sections 10-114 and 140.7 relative to allowable energy use for outdoor lighting. In addition, the IESNA 10th Edition Lighting Handbook defines Recommended Light Trespass Limits in Table 25.5, included in the Appendix C hereto, relative to the Outdoor Lighting Zones. The Recommended Light Trespass Illuminance Limits describe the maximum Light Trespass values in Lux at the location where trespass is under review. As noted above, the CEC stipulates that all urban areas in California are designated as Lighting Zone 3. IESNA Table 25.5, lists a Pre-curfew 8 Lux (0.74 footcandles) maximum at the location where trespass is under review for Zone 3.

4. Significance Threshold

The recommended lighting regulations identified in Section 2.2 above will ensure that significant light or glare impacts will not occur as a result of the Sunset Strip Off-Site Signage Policy. Appendix G of the California Environmental Quality Act (CEQA) Guidelines (14 California Code of Regulations, Sections 15000–15387) provides a set of sample questions to evaluate impacts with regard to aesthetics, including light and glare. The question that pertains to light and glare is as follows:

Would the project:

- Create a new source of substantial light and glare which would adversely affect day or nighttime views in the area?

In the context of this question from Appendix G of the CEQA Guidelines, the determination of significance takes into account the following factors:

- The change in ambient nighttime levels as a result of project sources; and
- The extent to which project lighting would spill off the project site and affect adjacent residential zoned properties.

Implementation of the lighting regulations in Section 2.2 will prevent a significant impacts with regard to artificial light or glare because:

- The Project will not exceed 1.4 foot-candles at the property line of a residential zoned property and will therefore not adversely change the ambient light level at residential properties.
- The Project will not exceed 300 cd/m^2 and will therefore not create new high contrast conditions visible from a field of view from a residential zoned property or driver on Sunset Boulevard.

APPENDIX A California Building Energy Efficiency Standards, Section 10-114.

10-114 – DETERMINATION OF OUTDOOR LIGHTING ZONES AND ADMINISTRATIVE RULES FOR USE

This section establishes rules for implementing outdoor lighting zones to show compliance with Section 140.7 of Title 24, California Code of Regulations, Part 6.

(a) **Lighting Zones.** Exterior lighting allowances in California vary by Lighting Zones (LZ).

(b) **Lighting Zone Characteristics.** TABLE 10-114-A specifies the relative ambient illumination level and the statewide default location for each lighting zone.

(c) **Amending the Lighting Zone Designation.** A local jurisdiction may officially adopt changes to the lighting zone designation of an area by following a public process that allows for formal public notification, review, and comment about the proposed change. The local jurisdiction may determine areas where Lighting Zone 4 is applicable and may increase or decrease the lighting zones for areas that are in State Default Lighting Zones 1, 2 and 3, as specified in TABLE 10-114-A.

(d) **Commission Notification, Amended Outdoor Lighting Zone Designation.** Local jurisdictions who adopt changes to the State Default Lighting Zones shall notify the Commission by providing the following materials to the Executive Director:

1. A detailed specification of the boundaries of the adopted Lighting Zones, consisting of the county name, the city name if any, the zip code(s) of the re designated areas, and a description of the physical boundaries within each zip code;
2. A description of the public process that was conducted in adopting the Lighting Zone changes; and
3. An explanation of how the adopted Lighting Zone changes are consistent with the specifications of Section 10-114.

(e) The Commission shall have the authority to not allow Lighting Zone changes which the Commission finds to be inconsistent with the specifications of Section 10-114.

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TABLE 10-114-A LIGHTING ZONE CHARACTERISTICS AND RULES FOR AMENDMENTS BY LOCAL JURISDICTIONS

Zone	Ambient Illumination	State wide Default Location	Moving Up to Higher Zones	Moving Down to Lower Zones
LZ0	Very Low	Undeveloped areas of government designated parks, recreation areas, and wildlife preserves.	Undeveloped areas of government designated parks, recreation areas, and wildlife preserves can be designated as LZ1 or LZ2 if they are contained within such a zone.	Not applicable
LZ1	Low	Developed portion of government designated parks, recreation areas, and wildlife preserves. Those that are wholly contained within a higher lighting zone may be considered by the local government as part of that lighting zone.	Developed portion of a government designated park, recreation area, or wildlife preserve, can be designated as LZ2 or LZ3 if they are contained within such a zone.	Not applicable.
LZ2	Moderate	Rural areas, as defined by the 2010 U.S. Census.	Special districts within a default LZ2 zone may be designated as LZ3 or LZ4 by a local jurisdiction. Examples include special commercial districts or areas with special security considerations located within a rural area.	Special districts and government designated parks within a default LZ2 zone maybe designated as LZ1 by the local jurisdiction for lower illumination standards, without any size limits.
LZ3	Moderately High	Urban areas, as defined by the 2010 U.S. Census.	Special districts within a default LZ3 may be designated as a LZ4 by local jurisdiction for high intensity nighttime use, such as entertainment or commercial districts or areas with special security considerations requiring very high light levels.	Special districts and government designated parks within a default LZ3 zone may be designated as LZ1 or LZ2 by the local jurisdiction, without any size limits.
LZ4	High	None.	Not applicable.	Not applicable.

APPENDIX B The IESNA 10th Edition Lighting Handbook, Table 26.4, Nighttime Outdoor Lighting Zone Definitions

Table 26.4 | Nighttime Outdoor Lighting Zone Definitions

Zone	Outdoor Lighting Situation	Definition
LZ4	High Ambient Lighting	Areas of human activity where the vision of human residents and users is adapted to high light levels. Lighting is generally considered necessary for safety, security and/or convenience and it is mostly uniform and/or continuous. After curfew, lighting may be extinguished or reduced in some areas as activity levels decline.
LZ3	Moderately High Ambient Lighting	Areas of human activity where the vision of human residents and users is adapted to moderately high light levels. Lighting is generally desired for safety, security and/or convenience and it is often uniform and/or continuous. After curfew, lighting may be extinguished or reduced in most areas as activity levels decline.
LZ2	Moderate Ambient Lighting	Areas of human activity where the vision of human residents and users is adapted to moderate light levels. Lighting may typically be used for safety and convenience but it is not necessarily uniform or continuous. After curfew, lighting may be extinguished or reduced as activity levels decline.
LZ1	Low Ambient Lighting	Areas where lighting might adversely affect flora and fauna or disturb the character of the area. The vision of human residents and users is adapted to low light levels. Lighting may be used for safety and convenience but it is not necessarily uniform or continuous. After curfew, most lighting should be extinguished or reduced as activity levels decline.
LZ0	No Ambient Lighting	Areas where the natural environment will be seriously and adversely affected by lighting. Impacts include disturbing the biological cycles of flora and fauna and/or detracting from human enjoyment and appreciation of the natural environment. Human activity is subordinate in importance to nature. The vision of human residents and users is adapted to the darkness, and they expect to see little or no lighting. When not needed, lighting should be extinguished.

The IESNA 10th Edition Lighting Handbook, Table 26.5, Recommended Light Trespass Illuminance Limits

Table 26.5 | Recommended Light Trespass Illuminance Limits

Lighting Zone	Limit in lux[a]	
	Pre-curfew	Post-curfew
LZ4	15	6
LZ3	8	3
LZ2	3	1
LZ1	1	0
LZ0	0.1	0

a. Maximum initial illuminance on a plane perpendicular to the line of sight to the luminaire(s). Plane located at observer position where light trespass is under review. [7]

APPENDIX C California Building Energy Efficiency Standards, Section 100.6-Signs.

requirements that uniquely apply to additions, alterations or repairs to existing buildings, and specify which requirements in other sections also apply. For alterations that change the occupancy classification of the building, the requirements specified in Section 141.0 apply to the occupancy after the alterations.

B. **Low-rise residential buildings.** Section 150.2 applies to new construction in existing low-rise residential buildings. New construction in existing buildings includes additions, alterations and repairs. Section 150.2 specifies requirements that uniquely apply to additions, alterations or repairs to existing buildings, and specify which requirements in other sections also apply. For alterations that change the occupancy classification of the building, the requirements specified in Section 150.2 apply to the occupancy after the alterations.

4. **Installation of insulation in existing buildings.** Section 110.8(d) applies to buildings in which insulation is being installed in existing attics, or on existing water heaters, or existing space conditioning ducts.

5. **Outdoor Lighting.** Sections 110.9, 130.0, 130.2, 130.4, 140.7, and 150.0 apply to newly constructed outdoor lighting systems, and Section 141.0 applies to outdoor lighting that is either added or altered.

6. **Signs.** Sections 130.0, 130.3 and 140.8 apply to newly constructed signs located either indoors or outdoors and Section 141.0 applies to sign alterations located either indoors or outdoors.

(f) **Mixed Occupancy.** When a building is designed and constructed for more than one type of occupancy (residential and nonresidential), the space for each occupancy shall meet the provisions of Part 6 applicable to that occupancy.

EXCEPTION 1 to Section 100.0(f): If one occupancy constitutes at least 80 percent of the conditioned floor area of the building, the entire building envelope, HVAC, and water heating may be designed to comply with the provisions of Part 6 applicable to that occupancy, provided that the applicable lighting requirements in Sections 140.6 through 140.8 or 150.0(k) are met for each occupancy and space and mandatory measures in Sections 110.0 through 130.5, and 150.0 are met for each occupancy and space.

EXCEPTION 2 to Section 100.0(f): If one occupancy constitutes at least 90 percent of the combined conditioned plus unconditioned floor area of the building, the entire building indoor lighting may be designed to comply with only the lighting provisions of Part 6 applicable to that occupancy.

(g) **Administrative Requirements.** Administrative requirements relating to permit requirements, enforcement by the Commission, locally adopted energy standards, interpretations, claims of exemption, approved calculation methods, rights of appeal, and certification and labeling requirements of fenestration products and roofing products are specified in California Code of Regulations, Title 24, Part 1, Sections 10-101 to 10-114.

(h) **Certification Requirements for Manufactured Equipment, Products, and Devices.** Part 6 limits the installation of manufactured equipment, products, and devices to those that have been certified as specified by sections 110.0 and 110.1.

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APPENDIX D California Building Energy Efficiency Standards, Section 100.6-Definitions.

SERVICE WATER HEATING is heating of water for sanitary purposes for human occupancy, other than for comfort heating.

SHADING is the protection from heat gains because of direct solar radiation by permanently attached exterior devices or building elements, interior shading devices, glazing material, or adherent materials.

SHADING COEFFICIENT (SC) is the ratio of the solar heat gain through a fenestration product to the solar heat gain through an unshaded 1/8-inch-thick clear double strength glass under the same set of conditions. For nonresidential, high-rise residential, and hotel/motel buildings, this shall exclude the effects of mullions, frames, sashes, and interior and exterior shading devices.

SIGN definitions include the following:

ELECTRONIC MESSAGE CENTER (EMC) is a pixilated image producing electronically controlled sign formed by any light source. Bare lamps used to create linear lighting animation sequences through the use of chaser circuits, also known as "chaser lights" are not considered an EMC.

ILLUMINATED FACE is a side of a sign that has the message on it. For an exit sign it is the side that has the word "EXIT" on it.

SIGN, CABINET is an internally illuminated sign consisting of frame and face, with a continuous translucent message panel, also referred to as a panel sign.

SIGN, CHANNEL LETTER is an internally illuminated sign with multiple components, each built in the shape of an individual three dimensional letters or symbol that are each independently illuminated, with a separate translucent panel over the light source for each element.

SIGN, DOUBLE-FACED is a sign with two parallel opposing faces.

SIGN, EXTERNALLY ILLUMINATED is any sign or a billboard that is lit by a light source that is external to the sign directed towards and shining on the face of the sign.

SIGN, INTERNALLY ILLUMINATED is a sign that is illuminated by a light source that is contained inside the sign where the message area is luminous, including cabinet signs and channel letter signs.

SIGN, TRAFFIC is a sign for traffic direction, warning, and roadway identification.

SIGN, UNFILTERED is a sign where the viewer perceives the light source directly as the message, without any colored filter between the viewer and the light source, including neon, cold cathode, and LED signs.

APPENDIX E California 2016 Building Energy Efficiency Standards, Section 130.3- SIGN LIGHTING CONTROLS.

SECTION 130.3 – SIGN LIGHTING CONTROLS

Nonresidential, high-rise residential and hotel/motel buildings shall comply with the applicable requirements of Section 130.3(a)1 through 130.3(a)3.

(a) **Controls for Sign Lighting.** All sign lighting shall meet the requirements below as applicable:

1. **Indoor Signs.** All indoor sign lighting shall be controlled with an automatic time-switch control or astronomical time-switch control.
2. **Outdoor Signs.** Outdoor sign lighting shall meet the following requirements as applicable:
   A. All outdoor sign lighting shall be controlled with a photocontrol in addition to an automatic time-switch control, or an astronomical time-switch control.

      EXCEPTION to Section 130.3(a)2A: Outdoor signs in tunnels, and signs in large permanently covered outdoor areas that are intended to be continuously lit, 24 hours per day and 365 days per year.

   B. All outdoor sign lighting that is ON both day and night shall be controlled with a dimmer that provides the ability to automatically reduce sign lighting power by a minimum of 65 percent during nighttime hours. Signs that are illuminated at night and for more than 1 hour during daylight hours shall be considered ON both day and night.

      EXCEPTION to Section 130.3(a)2B: Outdoor signs in tunnels and large covered areas that are intended to be illuminated both day and night.
3. **Demand Responsive Electronic Message Center Control.** An Electronic Message Center (EMC) having a new connected lighting power load greater than 15 kW shall have a control installed that is capable of reducing the lighting power by a minimum of 30 percent when receiving a demand response signal.

EXCEPTION to Section 130.3(a)3: Lighting for EMCs that is not permitted by a health or life safety statute, ordinance, or regulation to be reduced by 30 percent.

APPENDIX F California 2016 Building Energy Efficiency Standards, Section 140.8- REQUIREMENTS FOR SIGNS.

SECTION 140.8 – REQUIREMENTS FOR SIGNS

This section applies to all internally illuminated and externally illuminated signs, unfiltered light emitting diodes (LEDs), and unfiltered neon, both indoor and outdoor. Each sign shall comply with either Subsection (a) or (b), as applicable.

(a) **Maximum Allowed Lighting Power.**

1. For internally illuminated signs, the maximum allowed lighting power shall not exceed the product of the illuminated sign area and 12 watts per square foot. For double-faced signs, only the area of a single face shall be used to determine the allowed lighting power.
2. For externally illuminated signs, the maximum allowed lighting power shall not exceed the product of the illuminated sign area and 2.3 watts per square foot. Only areas of an externally lighted sign that are illuminated without obstruction or interference, by one or more luminaires, shall be used.
3. Lighting for unfiltered light emitting diodes (LEDs) and unfiltered neon shall comply with Section 140.8(b).

(b) **Alternate Lighting Sources.** The sign shall comply if it is equipped only with one or more of the following light sources:

1. High pressure sodium lamps; or
2. Metal halide lamps that are:
   A. Pulse start or ceramic served by a ballast that has a minimum efficiency of 88 percent or greater; or
   B. Pulse start that are 320 watts or smaller, are not 250 watt or 175 watt lamps, and are served by a ballast that has a minimum efficiency of 80 percent.

   Ballast efficiency is the measured output wattage to the lamp divided by the measured operating input wattage when tested according to ANSI C82.6-2005.
3. Neon or cold cathode lamps with transformer or power supply efficiency greater than or equal to following:
   A. A minimum efficiency of 75 percent when the transformer or power supply rated output current is less than 50 mA; or
   B. A minimum efficiency of 68 percent when the transformer or power supply rated output current is 50 mA or greater.

   The ratio of the output wattage to the input wattage is at 100 percent tubing load.
4. Fluorescent lighting systems meeting one of the following requirements:
   A. Use only lamps with a minimum color rendering index (CRI) of 80; or
   B. Use only electronic ballasts with a fundamental output frequency not less than 20 kHz.
5. Light emitting diodes (LEDs) with a power supply having an efficiency of 80 percent or greater; or

   EXCEPTION to Section 140.8(b)5: Single voltage external power supplies that are designed to convert 120 volt AC input into lower voltage DC or AC output, and have a nameplate output power less than or equal to 250 watts, shall comply with the applicable requirements of the Appliance Efficiency Regulations (Title 20).
6. Compact fluorescent lamps that do not contain a medium screw base sockets (E24/E26).

EXCEPTION 1 to Section 140.8: Unfiltered incandescent lamps that are not part of an electronic message center (EMC), an internally illuminated sign, or an externally illuminated sign.

EXCEPTION 2 to Section 140.8: Exit signs. Exit signs shall meet the requirements of the Appliance Efficiency Regulations.

EXCEPTION 3 to Section 140.8: Traffic Signs. Traffic signs shall meet the requirements of the Appliance Efficiency Regulations.

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APPENDIX G California 2016 Building Energy Efficiency Standards, Section 141.0- ADDITIONS, ALTERATIONS, AND REPAIRS TO EXISTING … OUTDOOR LIGHTING, AND TO INTERNALLY AND EXTERNALLY ILLUMINATED SIGNS.

SUBCHAPTER 6
NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES—ADDITIONS, ALTERATIONS, AND REPAIRS

SECTION 141.0 – ADDITIONS, ALTERATIONS, AND REPAIRS TO EXISTING NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL BUILDINGS, TO EXISTING OUTDOOR LIGHTING, AND TO INTERNALLY AND EXTERNALLY ILLUMINATED SIGNS

Additions, alterations, and repairs to existing nonresidential, high-rise residential, and hotel/motel buildings, existing outdoor lighting for these occupancies, and internally and externally illuminated signs, shall meet the requirements specified in Sections 100.0 through 110.10, and 120.0 through 130.5 that are applicable to the building project, and either the performance compliance approach (energy budgets) in Section 141.0(a)2 (for additions) or 141.0(b)3 (for alterations), or the prescriptive compliance approach in Section 141.0(a)1 (for additions) or 141.0(b)2 (for alterations), for the Climate Zone in which the building is located. Climate zones are shown in FIGURE 100.1-A.

Covered process requirements for additions, alterations and repairs to existing nonresidential, high-rise residential, and hotel/motel buildings are specified in Section 141.1.

NOTE: For alterations that change the occupancy classification of the building, the requirements specified in Section 141.0(b) apply to the occupancy after the alterations.

(a) **Additions.** Additions shall meet either Item 1 or 2 below.

1. **Prescriptive approach.** The envelope and lighting of the addition; any newly installed space-conditioning system, electrical power distribution system, or water-heating system; any addition to an outdoor lighting system; and any new sign installed in conjunction with an indoor or outdoor addition shall meet the applicable requirements of Sections 110.0 through 130.5 and Sections 140.2 through 140.9.
2. **Performance approach.**
   A. The envelope and indoor lighting in the conditioned space of the addition, and any newly installed space-conditioning system, electrical power distribution system, or water-heating system, shall meet the applicable requirements of Sections 110.0 through 130.5; and
   B. Either:
      i. The addition alone shall comply with Section 140.1; or
      ii. Existing plus addition plus alteration. The standard design for existing plus addition, plus alteration energy use is the combination of the existing building's unaltered components to remain, existing building altered components that are the more efficient, in TDV energy, of either the existing conditions, or the requirements of Section 141.0(b)2, plus the proposed addition's energy use meeting the requirements of Section 140.1. The proposed design energy use is the combination of the existing building's unaltered components to remain and the altered component's energy features, plus the proposed energy features of the addition.

EXCEPTION 1 to Section 141.0(a): When heating, cooling, or service water heating to an addition are provided by expanding existing systems, the existing systems and equipment need not comply with Sections 110.0 through 120.9, or Sections 140.4 through 140.5.

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APPENDIX H Table A5.106.8 in Section 5.106.8 of the CALGreen Code

2. See Vehicle Code Section 22511 for EV charging spaces signage in off-street parking facilities and for use of EV charging spaces.
3. The Governor's Office of Planning and Research published a Zero-Emission Vehicle Community Readiness Guidebook which provides helpful information for local governments, residents and businesses. www.opr.ca.gov/docs/ZEV_Guidebook.pdf.

5.106.8 Light pollution reduction. [N] Outdoor lighting systems shall be designed and installed to comply with the following:

1. The minimum requirements in the *California Energy Code* for Lighting Zones 1-4 as defined in Chapter 10 of the *California Administrative Code*; and
2. Backlight, Uplight and Glare (BUG) ratings as defined in IES TM-15-11; and
3. Allowable BUG ratings not exceeding those shown in Table 5.106.8, or

Comply with a local ordinance lawfully enacted pursuant to Section 101.7, whichever is more stringent.

Exceptions: [N]

1. Luminaires that qualify as exceptions in Section 140.7 of the *California Energy Code.*
2. Emergency lighting.
3. Building facade meeting the requirements in Table 140.7-B of the *California Energy Code,* Part 6.
4. Custom lighting features as allowed by the local enforcing agency, as permitted by Section 101.8 Alternate materials, designs and methods of construction.

Note: [N] See also *California Building Code,* Chapter 12, Section 1205.6 for college campus lighting requirements for parking facilities and walkways.

5.106.10 Grading and paving. Construction plans shall indicate how site grading or a drainage system will manage all surface water flows to keep water from entering buildings. Examples of methods to manage surface water include, but are not limited to, the following:

1. Swales.
2. Water collection and disposal systems.
3. French drains.
4. Water retention gardens.
5. Other water measures which keep surface water away from buildings and aid in groundwater recharge.

Exception: Additions and alterations not altering the drainage path.

TABLE 5.106.8 [N]
MAXIMUM ALLOWABLE BACKLIGHT, UPLIGHT AND GLARE (BUG) RATINGS[1,2]

ALLOWABLE RATING	LIGHTING ZONE 1	LIGHTING ZONE 2	LIGHTING ZONE 3	LIGHTING ZONE 4
Maximum Allowable Backlight Rating[3]				
Luminaire greater than 2 mounting heights (MH) from property line	No Limit	No Limit	No Limit	No Limit
Luminaire back hemisphere is 1 – 2 MH from property line	B2	B3	B4	B4
Luminaire back hemisphere is 0.5 – 1 MH from property line	B1	B2	B3	B3
Luminaire back hemisphere is less than 0.5 MH from property line	B0	B0	B1	B2
Maximum Allowable Uplight Rating				
For area lighting[4]	U0	U0	U0	U0
For all other outdoor lighting, including decorative luminaires	U1	U2	U3	U4
Maximum Allowable Glare Rating[5]				
Luminaire greater than 2 MH from property line	G1	G2	G3	G4
Luminaire front hemisphere is 1 – 2 MH from property line	G0	G1	G1	G2
Luminaire front hemisphere is 0.5 – 1 MH from property line	G0	G0	G1	G1
Luminaire back hemisphere is less than 0.5 MH from property line	G0	G0	G0	G1

1. IESNA Lighting Zones 0 and 5 are not applicable; refer to Lighting Zones as defined in the *California Energy Code* and Chapter 10 of the *California Administrative Code.*
2. For property lines that abut public walkways, bikeways, plazas and parking lots, the property line may be considered to be 5 feet beyond the actual property line for purpose of determining compliance with this section. For property lines that abut public roadways and public transit corridors, the property line may be considered to be the centerline of the public roadway or public transit corridor for the purpose of determining compliance with this section.
3. If the nearest property line is less than or equal to two mounting heights from the back hemisphere of the luminaire distribution, the applicable reduced Backlight rating shall be met.
4. General lighting luminaires in areas such as outdoor parking, sales or storage lots shall meet these reduced ratings. Decorative luminaires located in these areas shall meet *U*-value limits for "all other outdoor lighting."
5. If the nearest property line is less than or equal to two mounting heights from the front hemisphere of the luminaire distribution, the applicable reduced Glare rating shall be met.

ATTACHMENT B

Francis J. Krahe, PE/IALD/IES/LC

BIOGRAPHY

Mr. Krahe established Francis Krahe & Associates in 1983 to provide a innovative approach to lighting design and engineering. As an architectural engineer he shaped the firm to pursue his perspective on the relationship between quality design and the business of architecture and building construction. Since the firm's inception, his understanding of the impact and power of dramatic, creative lighting solutions has produced projects where lighting has enhanced and embellished the architecture. These same projects were equally successful in meeting the clients' budget and schedule. Mr. Krahe's responsibility is to insure that every project meets or exceeds the client's expectations.

Mr. Krahe is an experienced expert with respect to illumination engineering and design for large scale projects and urban plans. He has designed city wide lighting master plans, street lighting and street scape plans, and large scale institutional and commercial projects. He has authored lighting ordinances and specific plan regulations, and participated in over 20 environmental impact studies with respect to night time illumination.

The unique design quality delivered by Francis Krahe & Associates is a result of his lighting design solutions for a spectrum of projects including civic venues, corporate headquarters, commercial office buildings, hotels, museums, laboratory and research facilities, airports and transit systems, and retail interiors.

EXPERIENCE

33 Years with Francis Krahe & Associates

37 Total Years Experience

ACADEMIC DEGREE

Bachelor of Architectural Engineering, 1979

Pennsylvania State University

University Park, Pennsylvania

PROFESSIONAL AFFILIATIONS

Professional Electrical Engineer, California, New York

International Association of Lighting Designers (IALD)

Illuminating Engineering Society (IES)

Urban Land Institute

American Institute of Architects Los Angeles

American Society of Solar Energy

U.S. Green Building Council

AWARDS

2016 IES Award of Excellence, Taylor Center for Performing Arts, Mount Royal University

2016 Loews Chicago Hotel

2016 UCSD Biomedical Research Facillity II

2014 IES Award of Merit, Jacobs Engineering HQ

2014 IES Award of Merit, Wilshire Blvd. Temple

2012 IES Award of Merit, McAfee Headquarters

2011 IES Award of Merit, Los Angeles Trade Tech

2010 IES Award of Merit, LMU Hannon Library

Lighting Environmental Impact Reports

Westfield Promenade, Woodland Hills, CA, Westfield, Latham & Watkins

Figueroa Convention Center Hotel, Downtown Los Angeles, CA, Lightstone Group

Mixed Use Project EIR Study, Downtown Los Angeles, CA, Spectrum Group

Retail Development EIR Study, Hollywood, CA, Liner Law LLC

Mixed Use Project EIR Study, Downtown Los Angeles, CA, Greenland

Mixed Use Project EIR Study, Downtown Los Angeles, CA, Liner Law, LLC, Hazens Group

Los Angeles Football Club EIR Study, Latham & Watkins

8228 Sunset Blvd. Signage EIR Study, West Hollywood, California

9015 Sunset Blvd. Signage EIR Study, West Hollywood, California

Pepperdine University EIR, Malibu, California

Archer School for Girls EIR, Los Angeles, California

Wilshire Blvd. Temple EIR, Los Angeles, California

NBC Universal City Lighting Plan EIR, Universal City, California

8410 Sunset Blvd. Signage EIR Study, West Hollywood, California

8801 Sunset Blvd. Signage EIR Study, West Hollywood, California

Dark Sky Ordinance & EIR for the City of Calabasas, California

Aliso Creek Area Redevelopment Site EIR, Aliso Creek, California

APPENDIX E

Traffic Memorandum

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ATTACHMENT B

FEHR PEERS

DRAFT MEMORANDUM

Date: May 31, 2017

To: Bianca Siegl, City of West Hollywood

From: Jeremy Klop and Chelsea Richer, Fehr & Peers

Subject: ***Updated Digital Off-Site Signage Analysis Addressing Traffic Safety***

Ref: LA14-2717.00

This memorandum updates prior work conducted for the City of West Hollywood, documented in a memorandum dated December 16, 2014. The previous memo was attached to the Negative Declaration for the Creative Billboard Ordinance in 2016. The purpose of this memorandum is compare the standards recommended in the previous memo to the draft Sunset Boulevard Off-Site Signage Policy, key points of which are shown in italics.

The remainder of this memo describes the application of industry standards as they relate to the draft *Sunset Boulevard Off-Site Signage Policy*. The memo also includes a brief summary of the research related to this topic and concludes with a brief discussion of future digital signage considerations and broader safety recommendations for the Sunset Strip Billboard District.

LITERATURE REVIEW SUMMARY

The previous work conducted for the City of West Hollywood, documented in a memorandum dated December 2014, included an extensive literature review of both academic and industry-sponsored studies. This review included literature ranging from 1980 to 2013. Overall, the literature did not present compelling evidence in either direction on the question of whether digital signage worsens driver distraction, causes traffic safety concerns, or is generalizable and applicable in a context such as the Sunset Strip. Many studies were limited in their sample size, conducted along rural or suburban freeways (i.e., a substantially different context than the Sunset Strip), or did not demonstrate statistically significant causality related to collision patterns. Average driving speed on the Sunset Strip is 32-35 miles per hour, typically lower than the assumed speed for studies that evaluate Digital Billboards that are viewed from freeways and rural area. Since 2013, few additional studies have been released, none of which present findings that are more compelling than those published between 1980 and 2013. However, in that time frame, digital Billboards have become more popular, and neighboring jurisdictions, including the City of Los Angeles, have continued to advance their standards for regulation. Significantly, the City of Los Angeles is in the process of increasing the digital billboard presence in the downtown area, and developed a Specific Plan and several Sign Use Districts that include regulations tailored for digital billboards in an urban setting.

ATTACHMENT B

Policies to regulate digital signage focus on standards related to acceptable lighting levels and the reduction of excessive distractions such as interactive components, visually jarring transitions, and the size of the signs. These standards have been tailored to the specific context of Sunset Blvd (32-35 mph average speed; high ambient light), and are described in the next section alongside the components of the *Sunset Boulevard Off-Site Signage Policy* that relate to them.

APPLICATION OF SIGNAGE STANDARDS WITHIN THE SUNSET BOULEVARD OFF-SITE SIGNAGE POLICY

The draft West Hollywood policy focuses on reducing contrast as an effective means of reducing distraction rather than limiting advertising content. The draft Sunset Boulevard Off-Site Signage Policy requires significantly lower light levels that the current industry norm, as indicated in a May, 2017 memorandum by the firm Francis Krahe & Associates, including regulations for monitoring and sensors that automatically adjust brightness in relation to ambient light

The following categories, reviewed in the 2014 memorandum, summarize the full set of available regulatory options and the draft policy response. Areas of particular concern include high intensity and/or color lighting or moving images that could be mistaken by a driver as a traffic control device or an emergency vehicle, such as red or yellow lights accompanied by flashing or strobing effects. Similarly, flashing motion, strobing effects, or blinding luminance are a high priority area for regulations in light of traffic safety concerns.

Animation and Movement

Some types of movement are considered to be more distracting than other types, and accordingly regulations can be crafted to prohibit "flashing, strobing, or racing" effects (Morris, 2009; Roberts, 2013). The State of California also prohibits any "red or blinking or intermittent light likely to be mistaken for a warning or danger signal" if the sign is visible from a highway (Caltrans, 2014). This provision is similar to the overarching provision already found within the West Hollywood Municipal Code (Section 19.34.040) that prohibits colored lights or other design elements that may be confused with or mistaken for traffic-control devices.

The draft Sunset Boulevard Off-Site Signage Policy allows animation but prohibits moving patterns that use stroboscopic or flashing images, prohibits signage that could be confused with traffic control devices, and only permits moving patterns from sunrise to 2:00 AM. Additionally, the recommendations described in the May, 2017 memorandum by the lighting engineering firm Francis Krahe & Associates focus on reducing contrast as an effective means of avoiding potential distraction in a highly urban area.

Placement and Spacing

The 2014 memo recommends standards for placement and spacing to avoid too much visual clutter.

The Sunset Boulevard Off-Site Signage Policy limits the total number of signs along the 1.6-mile corridor to 20, and spaces the digital signs across seven zones of approximately 2-3 blocks each, along the West Region, Central Region, and East Region of Sunset Boulevard.

Text Size and Amount

Roberts (2013) recommends the quantity of information be confined to the number of words that can be read during the approach within two seconds, or the point at which away-from-forward glance becomes twice as likely to result in a crash. This formula first requires an estimated "legibility distance," which takes into account distance and speed, and a comprehension rate (Roberts, 2013). Roberts recommends a comprehension rate of three words per second, depending on font size and complexity, and text formatting and design (Roberts 2013).

Text size may be regulated to be larger than a minimum size, set by the speed limit of the road and the sign industry's "best practices" formula, or regulated to a maximum number of words, but notes that this standard is rarely applied (Morris, 2009).

The Sunset Boulevard Off-Site Signage Policy does not currently specify text size but could consider setting a minimum text size standard based on the guidelines set forth in the United States Sign Council's 2006 Sign Legibility Rules of Thumb (available online at http://www.usscfoundation.org/USSCSignLegiRulesThumb.pdf). The policy prohibits scrolling text. The recommendations from Francis Krahe & Associates focus on reducing contrast as an effective means of avoiding potential distraction in a highly urban area.

Illuminance and Luminance

Illuminance refers to the light energy landing on a surface at a distance from a sign, while luminance refers to the light energy at the sign surface itself. The FHWA recommends adjusting luminance in response to ambient illuminance to ensure signage is not "unreasonably bright for the safety of the motoring public" (FHWA, 2007). For areas of medium to high ambient illuminance, academic literature recommends digital signs should not exceed 0.8 foot candles and that digital signs should be equipped with auto-dimming technology (Gottwald, 2011). These standards refer specifically to on-site signage; a lighting engineer should be consulted to ensure appropriate application of standards for off-site signage.

The Sunset Boulevard Off-Site Signage Policy sets the maximum illuminance levels at 1.4 foot candles at adjacent residential zones property lines. Although this maximum level exceeds the recommendations of 0.8 foot candles, it was developed based in part on a review of the 2016 CALGreen California Building Code, Los Angeles Municipal Code, which specifies a maximum of 3 foot candles in special signage districts, and the applicable recommendations from the IESNA. The Illuminating Engineering Society of North America (IESNA) defines Nightime Outdoor Lighting Zones, where LZ4 refers to "areas of human activity where the vision of residents and users is adapted to high light levels, and where illuminance should not exceed 15 lux (1.4 footcandles) at adjacent residential property lines where light trespass would be significant. Similar standards apply with respect to drivers vision: where the drivers vision is adapted to high ambient luminance, sign luminance will be a lower contrast to the surrounding surfaces and will be less prominent, therefore cause less distraction. This analysis was conducted by Francis Krahe & Associates, and the recommendations are documented in the May, 2017 memorandum.

Message Sequencing

Message sequencing refers to the use of multiple static images that comprise a single message, displayed in subsequent order to convey a longer message. Concerns about message sequencing developed out of an understanding of the Zeigarnik Effect, which refers to the subconscious compulsion to wait until a

message is complete before looking away. For signs with scrolling or sequential messages, this effect may encourage drivers to unexpectedly slow down to see the conclusion of the sequence (Morris et al, 2009). Roberts (2013) recommends message sequencing should be prohibited.

Although animated content is permitted in the draft Sunset Boulevard Off-Site Signage Policy, message sequencing is not addressed explicitly permitted or prohibited, but scrolling text is prohibited. The recommendations from Francis Krahe & Associates focus on reducing contrast rather than regulating advertising content as an effective means of avoiding potential distraction.

Message Hold Time

Message hold time refers to the length of time a message must remain before transitioning to another message (Carpentier, et al, 2014). The 2004 US Sign Council recommends a minimum on-time for each message such that "a motorist traveling the affected road at the 85th percentile speed would be able to read not more than one complete nor two partial messages in the time required to approach and pass the sign" (US Sign Council, 2004). Similarly, Roberts (2013) recommends message hold time be adjusted based on the speed environment and visibility distance.

The FHWA recommends an eight-second duration of display (FHWA). Other researchers similarly recommend an average of seven messages per minute, or 8.5 seconds per message (Durham, 2009).

The draft Sunset Boulevard Off-Site Signage Policy requires that static and animated messages are refreshed no more frequently than every 16 seconds to account for the average vehicle speed of 32-35 miles per hour. The recommendations from Francis Krahe & Associates focus on reducing contrast as an effective means of avoiding potential distraction in a highly urban area.

Transition Method and Duration

Transition method refers to the way in which one message changes to another message (Carpentier, 2014). This transition can occur instantaneously, via a dissolve effect, or through some other motion-dependent effect. Roberts (2013) recommends transition method should be instantaneous in order to minimize the potential for involuntary distraction or prolonged driver dwell time.

Transition duration refers to the amount of time it takes to switch from one message to another (Carpentier, 2014). The available research recommends between zero and two seconds for the transition duration (FHWA; Roberts, 2013; Carpentier, 2014). The available research indicates that if fully animated messages are permitted, it may be unnecessary to regulate transition methods and duration.

The draft Sunset Boulevard Off-Site Signage Policy permits animated messages, and requires a fade rate of at least one second between messages. The draft Policy also requires animated content to avoid edits at a rate of more than one edit every three seconds.

Area of Digital Sign

Area can be regulated by setting a minimum or maximum square footage for a digital sign, or by setting a minimum or maximum percentage of the entire sign that may be covered by digital content (Carpentier, 2014). Industry guidelines recommend billboard area be determined based on context, in coordination with

the expectations of the community, and with different standards for different zoning districts (Carpentier, 2014). Legally, size restrictions do not violate the First Amendment (Baker and Wolpert, 2011).

The draft Sunset Boulevard Off-Site Signage Policy establishes a maximum size for digital billboards of 1,000 square feet in total area unless it is converted from an existing billboard that is greater than 1,000 square feet, in which case it may be the size of the existing traditional billboard, not to exceed 1,200 square feet.

Operations

The timeframe during which a sign is operational can be regulated if the standards pass the "time, place, manner" test (Mandelker and Baker, 2014). The standards must be content-neutral, but may require all digital or internally-lit signage to turn off or dim after a certain time of night, for example. The standards can also require a sign to "rest in dark" rather than "rest in light". Furthermore, the FHWA recommends requiring a default designed to freeze the image in the event of a malfunction (FHWA, 2007). These types of regulations can ameliorate community concerns about light pollution or about exacerbating the dangers of impaired drivers past a certain time of night.

The draft Sunset Boulevard Off-Site Signage Policy regulates digital billboard operations in the following ways:

- *Digital billboards shall have control systems that enable programmed coordination between digital billboards owned or operated by different individuals*
- *On-site sound is permitted only during special events, subject to prior approval*
- *Animated sequences that result in visible brightness change over more than 10% of the total display area at a greater rate of three changes per second are prohibited*
- *Maximum luminance levels differ by time of day and ambient lighting conditions to minimize contrast. Automatic sensors are required that adjust sign luminance in relation to changes in ambient illuminance.*
- *Digital billboard operators are required to submit monitoring reports to the Community Development Department on a regular basis (at specified intervals after installation, and then annually for the duration of the sign's operation)*

DISCUSSION AND APPLICATION TO SUNSET STRIP BILLBOARD DISTRICT

Several key lessons from the literature review are applied to the Sunset Strip context via the draft Sunset Boulevard Off-Site Signage Policy:

- Luminance, illuminance, duration, and transition standards are strictly regulated according to industry recommendations and local precedents as researched by local lighting experts.
- Driver interactive components are prohibited. Full motion animation is permitted but strictly regulated to the same standards as static images for illuminance, luminance, duration, and transitions.

- Rapid motion, resemblance to traffic control devices, and strobing effects are prohibited.

Future considerations for digital billboards within the Sunset Strip Billboard District that may be enabled by more advanced technology include:

- Synchronization and coordination of signal timing along the corridor to encourage slower speeds during periods when high speeds are observed
- Coordination of signal timing patterns with digital signage movement or transitions to avoid distraction or confusion with traffic signal indications at intersections
- Dynamic control of digital signage to respond to roadway conditions such as speed, weather, time of day, or congestion
- Use of digital billboards to promote a certain amount of public safety content and messaging during the most relevant time of day (i.e., messaging to discourage drinking and driving during the hours when patrons leave nightlife establishments along the corridor)

Finally, West Hollywood is additionally focusing on addressing traffic safety within the Sunset Strip Billboard District by improving pedestrian facilities, bicycle facilities, and adopting policies aimed at improving safety along the corridor. City Council recently adopted the West Hollywood Pedestrian and Bicycle Master Plan, which includes programs and projects intended to improve safety and comfort for pedestrians and bicyclists city-wide. These programs and projects include education strategies and engineering strategies such as more frequent and visible pedestrian crossings, curb-bulb outs, median islands, hybrid beacons, street trees or other landscaping, and pedestrian scale street lighting.

Additional actions could include the adoption of a "park once" policy for the Sunset Strip Billboard District, encouraging visitors to the Sunset Strip to move about primarily as pedestrians rather than drivers, expanding or adjusting routes on local transit service (i.e., CityLine and PickUp Line), and engaging in an encouragement campaign with shops, bars, restaurants, and entertainment venues along the Sunset Strip.

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EXHIBIT A – PART II

FLASHING GUIDELINES

A. Flashing Images (e.g., strobing, flashing lights). Flashing and flickering images in color or black and white, which result in visible screen brightness changes of more than ten percent (10%) screen area at a rate exceeding three (3) flashes per second, should be avoided completely.

Moderate repetitive changes in screens brightness exceeding ten percent (10%) screen area are acceptable provided the difference in brightness over any two (2) consecutive frames in a sequence does not exceed ten percent (10%). This is measured as the difference in brightness between the lighter and corresponding darker image area expressed as a percentage of the brighter image. Brightness changes grater than ten percent (10%) will produce a visible "flash" and in this case only one (1) flash will be allowed in any nine-frame period.

Brightness level changes exceeding ten percent (10%) are also acceptable in small areas. Up to ten percent (10%) of the screen, either a single area of a sum of smaller parts, may change at any rate or brightness level.

Flashes involving highly saturated red should be avoided.

B. Fast Cutting. Avoid rapidly changing image sequences that result in a visible brightness change over more than ten percent (10%) of the screen area, at a greater rate than three (3) changes per second. An image, which changes every nine (9) frames or more, irrespective of its brightness or screen area is acceptable.

C. Static Patterns. Regular patterns, which cover more than ten percent (10%) of the screen area, should be avoided. A single pattern cycle may consist of distinct vertical, horizontal, diagonal, circular, radial line of bar segments followed by a segment of different brightness. Pattern cycles which are repeated can form grid patterns. Avoid patterns which produce the equivalent of ten (10) to forty (40) cycles across the screen and the difference in screen brightness between any two (2) adjacent segments exceed ten percent (10%).

D. Moving Patterns. Moving patterns, which flow smoothly across, into or out of the screen in one (1) direction, are not considered hazardous. However, a moving pattern, which changes direction, oscillates, flashes or reverses in contrast, should be avoided. Pattern contrast reversals using fully saturated red are not allowed.