

## **Appendix B**

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Metro TCN Lighting Study





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# Metro TCN Lighting Study

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This Lighting Study is prepared by Francis Krahe & Associates Inc. to analyze the potential lighting impacts from the proposed Metro TCN Sign Project (Project) at residential use and sensitive use properties adjacent to the Project sites. The Project includes sign installations at multiple properties of the Los Angeles Metropolitan Transit Authority (Metro) within the city of Los Angeles, California (City).

## A. SUMMARY

This Study concludes the proposed Project will not introduce a new source of light trespass and or glare at residential use properties or other sensitive use properties within the City of Los Angeles, California. The Project proposes to install new illuminated Signs within Los Angeles County Metropolitan Transportation Authority properties located within the City of Los Angeles. This Study evaluates the Project Sign locations, Sign sizes, and Sign operating characteristics, and determines the Project will not introduce a new source of light trespass or glare. This Study conservatively evaluated all 34 proposed Freeway Facing Sign locations and all 22 proposed Non Freeway Facing Sign locations by way of detailed site surveys of the Sign locations and surrounding properties located near enough to the Signs to receive significant light trespass or glare from the Signs. This Study also includes detailed light trespass illuminance and glare calculations at residential use property locations where a Sign is located near enough to the residential property to present a potential for light trespass and or glare.

This Study concludes the Project will not introduce a new source of light trespass at residential use properties or other sensitive use properties. All Sign locations (56 total) were surveyed to determine adjacent residential use properties or other sensitive use properties that may receive light trespass illuminance. Ten of the thirty-four Freeway Facing Sign locations were evaluated at night from adjacent Monitoring Sites where there was a potential for visibility of the Signs from residential properties nearby. One of the twenty-two Non Freeway Facing sign locations was evaluated at night from a monitoring site where there was a potential visibility of the Sign from a residential property nearby (see Table 3 below).

All Freeway Facing and Non Freeway Facing Signs were evaluated in comparison to a conservative maximum distance where light trespass from the Sign would be less than 0.30 fc or less than 10% of the maximum 3.0 fc permitted by the Los Angeles Municipal Code (LAMC). There are no residential use locations within 345 feet from Freeway Facing Sign FF-01. Therefore all residential use properties near FF-01 will receive less than 0.30 fc, or less than 10% of the maximum 3.0 fc permitted by LAMC. The majority of Freeway Facing Signs (26 of 34 locations, see Table 8, Appendix A and B) have no residential use locations within 270 feet from each Sign. For these 26 Sign locations where residential properties are more than 270 feet from the Freeway Facing Sign, the residential properties will receive less than 0.30 fc, or less than 10% of the maximum 3.0 fc permitted by LAMC. Eight Freeway Facing Signs are located less than 300 feet from residential use or hotel properties, and therefore were further evaluated to determine if the Signs are visible from the residential use, and if visible, the extent of light trespass illuminance. Freeway Facing Sign FF-21 is located 295 feet from the nearest residential and hotel use properties to the west of the Sign. Sign FF-21 light trespass illuminance will be less than 0.30 fc at the residential and hotel property lines to the west of FF-21, and will therefore not create an impact. Signs within 300 feet from residential or hotel use properties include Freeway Facing Signs FF-13, FF-26, FF-28, FF-29, FF-30, FF-33, and FF-34, which were evaluated by calculations to determine maximum light trespass illuminance at the nearest residential use property line. For these seven Freeway Facing Signs the maximum light trespass illuminance is 0.60 fc at FF-29 and FF-30, 0.30 fc at FF-13, 0.20 fc at FF-26 and FF-28, and 0.10 fc at FF-33. The maximum light trespass illuminance at residential properties near to these seven Freeway Facing Signs is less than 20% of the maximum permitted by LAMC at FF-29, and less than 10% at the remaining 33 locations. Therefore, the Freeway Facing Signs will not create a light trespass impact at residential or sensitive use properties.

Similarly, the majority of the Non Freeway Facing Signs (19 of 22 locations) have no residential use properties within 175 feet from the Sign location. Residential use locations more than 175 feet from Non Freeway Facing Signs will receive less than 0.30 fc, or less than 10% of the maximum 3.0 fc permitted by the LAMC. Residential use properties are more than 270 feet from Non Freeway Facing Signs NFF-08, NFF-17, and NFF-18, and therefore, will receive light trespass illuminance less than 0.30 fc. Residential use properties more than 175 feet from Non Freeway Facing Signs NFF-02 through NFF-07, NFF-09 through NFF-16, or NFF-19 though NFF-22 will receive less than 0.30 fc, or less than 10% of the maximum 3.0 fc permitted by the LAMC. Non Freeway Facing Sign NFF-01 is less than 175 feet from a residential use property, but is not

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visible from the nearby residential use property as described in Table 8 below, and therefore, will not create a light trespass impact at any surrounding residential use properties. Non Freeway Facing Signs NFF-14, NFF-15, and NFF-20 are located less than 175 feet from a residential property, and were further evaluated with illuminance calculations to determine the maximum light trespass illuminance at the nearest residential use property. For these three Non Freeway Facing Signs the maximum light trespass illuminance is 2.50 fc at NFF-20, 0.10 fc at NFF-15, and 0.00 fc at NFF-14. The light trespass illuminance at all Non Freeway Facing Sign locations is less than the maximum 3.0 fc permitted by LAMC. Therefore, the Non Freeway Facing Signs will not create a light trespass impact at residential or sensitive use properties.

Therefore, all Freeway Facing Signs and all Non Freeway Facing Signs will not create a substantial light trespass impact at any residential use property or any other sensitive use property.

Furthermore, the Project will not create a new source of glare. The Project potential to introduce a new source of glare is evaluated in this Study by comparison of the maximum night time sign luminance, which is set at 300 cd/m<sup>2</sup> in the Sign Concept Design (see Appendix A) in comparison to the existing luminance visible from the residential use properties where the Signs are visible. The existing luminance at adjacent residential use properties with a view to the Signs is documented at the Monitoring Sites as summarized in Table 6 below. The results of the comparison of the Sign maximum luminance to the existing measured luminance confirm the Signs will not introduce a source of high contrast or glare in comparison to the existing luminance at the residential use properties. The Project potential for glare is also evaluated with respect to the requirements of the California Vehicle Code, which regulates the maximum light source luminance which may affect the visibility of drivers on roadways. The maximum Project Sign luminance is substantially less than (82% less than) the maximum permitted by the California Vehicle Code during the night and during the day.

The methods of analysis utilized for this Study are based upon the recommended practices established by the Illuminating Engineering Society of North America (IESNA) for the practice of illumination engineering design and application, and the actual measurements of light sources and illuminated surfaces. IESNA reference publications include: American National Standards Institute (ANSI)/Illuminating Engineering Society (IES) OL-IM-01 Lighting Fundamentals, Metrics and Calculations; ANSI/IES OL-IM-02 Lighting Design, Engineering, and Specifications; ANSI/IES OL-IM-03 Lighting Design Criteria and Illumination Recommendations; and ANSI/IES OL-IM-04 Lighting Equipment Testing Procedures and Measurements. The ANSI/IES Standards replace the IESNA 10<sup>th</sup> Edition Handbook, which superseded the 9th Edition IESNA Handbook and various Recommended Practice (RP) References published by IESNA prior to 2011.

## B. PROJECT DESCRIPTION

The Los Angeles County Metropolitan Transportation Authority (Metro) proposes to implement the Transportation Communication Network (TCN) Program (Project or TCN Program), which would provide a network of structures with digital displays (TCN Structures) that would incorporate intelligent technology components to promote roadway efficiency, improve public safety, augment Metro's communication capacity, provide for outdoor advertising where revenues would fund new and expanded transportation programs consistent with the goals of the Metro 2028 Vision Plan, and result in an overall reduction in static signage displays throughout the City of Los Angeles (City). Implementation of the Project would include the installation of up to 34 Freeway-Facing TCN Structures and 22 Non-Freeway Facing TCN Structures all on Metro-owned property. The total maximum amount of digital signage associated with the TCN structures would be approximately 65,000 square feet. As part of implementation of the TCN structures, a take-down program would also be implemented whereby existing static displays would be removed. Signage to be removed would include approximately 200 static displays on Metro-owned property located within the City. As part of the Project, the City would establish a TCN Ordinance that would provide regulations regarding the implementation and operation of the TCN Structures.

Freeway Facing TCN Structures would include signs that can be viewed from the highway, while Non-Freeway Facing TCN Structures would be viewed from major streets. Each TCN Structure would have one or two faces depending on the location and line of site visibility. The digital display faces of the TCN Structures would use light emitting diodes (LED)

lighting with a daytime maximum up to 6,000 candelas per meter squared ( $\text{cd}/\text{m}^2$ ) and nighttime maximum of up to 300  $\text{cd}/\text{m}^2$ . The digital display faces would be designed to provide efficient and effective illumination while minimizing light spill, sky-glow, and glare.

Louvers would be installed to shade the LED lights from creating unintentional light spill, assist in reducing reflection, and in turn would create a sharper image. Further, the digital display faces would be set to refresh every eight seconds and would transition instantly with no motion, moving parts, flashing, or scrolling messages. Illumination of the digital displays would conform to applicable Federal and State Regulations for signs oriented towards roadways and freeways. Additionally, the TCN Structures would comply with current energy standards and regulations, as well as design requirements.

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Table 1: Freeway Facing Sign Locations

Sign ID	Map No.	Location
FF-01	3	US-101 North Lanes at Union Station
FF-02	3	US-101 South Lanes at Center Street
FF-03	3	US-101 North Lanes at Keller Street
FF-04	3	US-101 South Lanes at Beaudry Street
FF-05	1	US-101 North Lanes, Northwest of Lankershim Boulevard
FF-06	3	I-5 South Lanes at North Avenue 19
FF-07	3	I-5 North Lanes at San Fernando Road
FF-08	3	I-5 South Lanes and Exit Ramp to I-10
FF-09	3	I-10 West Lanes (Bus Yard)
FF-10	3	I-10 West Lanes and Entrance Ramp from I-5
FF-11	3	I-10 East Lanes and Exit Ramp to SR-60 and I-5
FF-12	3	I-10 West Lanes at Griffin Avenue and East 16th Street
FF-13	1	SR-2 South Lanes Northeast of Casitas Avenue
FF-14	1	SR-2 North Lanes Northeast of Casitas Avenue
FF-15	1	SR-170 South Lanes at Raymer Street
FF-16	1	SR-170 North Lanes North of Sherman Way
FF-17	1	I-5 North Lanes South of Tuxford Street
FF-18	1	I-5 South Lanes South of Tuxford Street
FF-19	1	SR-118 East of San Fernando Road
FF-20	1	SR-118 East of San Fernando Road
FF-21	2	I-110 South Lanes at Exposition Boulevard
FF-22	1	I-5 North Lanes at San Fernando Road
FF-23	2	I-110 North Lanes at Exposition Boulevard
FF-24	1	I-5 South Lanes at San Fernando Road and Sepulveda Boulevard
FF-25	1	I-405 South Lanes at Victory Boulevard
FF-26	2	I-405 North Lanes at Exposition Boulevard
FF-27	2	I-405 South Lanes at Exposition Boulevard
FF-28	2	I-10 West at Robertson Boulevard
FF-29	2	SR-90 East at Culver Boulevard
FF-30	2	SR-90 West at Culver Boulevard
FF-31	2	I-105 West Lanes at Aviation Boulevard
FF-32	2	I-105 East Lanes at Aviation Boulevard
FF-33	2	I-110 South Lanes at Slauson Avenue
FF-34	2	I-110 North Lanes at Slauson Avenue

Table 2: Non-Freeway Facing Sign Locations

<b>Sign ID</b>	<b>Map No.</b>	<b>Location</b>
NFF-1	1	Northeast corner of Vermont Avenue and Sunset Boulevard
NFF-2	3	Spring Street Bridge, 326 feet North of Aurora Street
NFF-3	1	Northwest corner of Lankershim Boulevard and Chandler Boulevard
NFF-4	1	Northwest corner of Lankershim Boulevard and Universal Hollywood Drive
NFF-5	1	Southwest corner of Lankershim Boulevard and Universal Hollywood Drive
NFF-6	3	Southwest corner of 4th Street and Hill Street
NFF-7	2	Venice Boulevard, 240 feet West of Robertson Boulevard
NFF-8	3	Southeast corner of Alameda Street and Commercial Street
NFF-9	1	Northeast corner of Van Nuys Boulevard and Orange Line Busline
NFF-10	1	Southeast corner of Sepulveda Boulevard and Erwin Street
NFF-11	2	Southwest of Crenshaw Boulevard, 175 feet South of 67th Street
NFF-12	2	Southeast corner of Crenshaw Boulevard and Exposition Boulevard
NFF-13	3	Southeast corner of East Cesar Chavez Avenue and North Vignes Street
NFF-14	2	Pico Boulevard and Exposition Boulevard, South of rail
NFF-15	2	Pico Boulevard, 445 feet West of Sawtelle Boulevard
NFF-16	3	Southeast corner of South Central Avenue and East 1st Street
NFF-17	2	Century Boulevard, 152 feet West of Aviation Boulevard
NFF-18	2	Southwest Aviation Boulevard and South of Arbor Vitae Street
NFF-19	2	Northwest corner of Vermont Avenue and Beverly Boulevard
NFF-20	2	Southwest corner of Santa Monica Boulevard and Vermont Avenue
NFF-21	3	South of 4th Street 210 feet East of South Santa Fe Avenue
NFF-22	3	Northwest corner of East 7th Street and South Alameda Street



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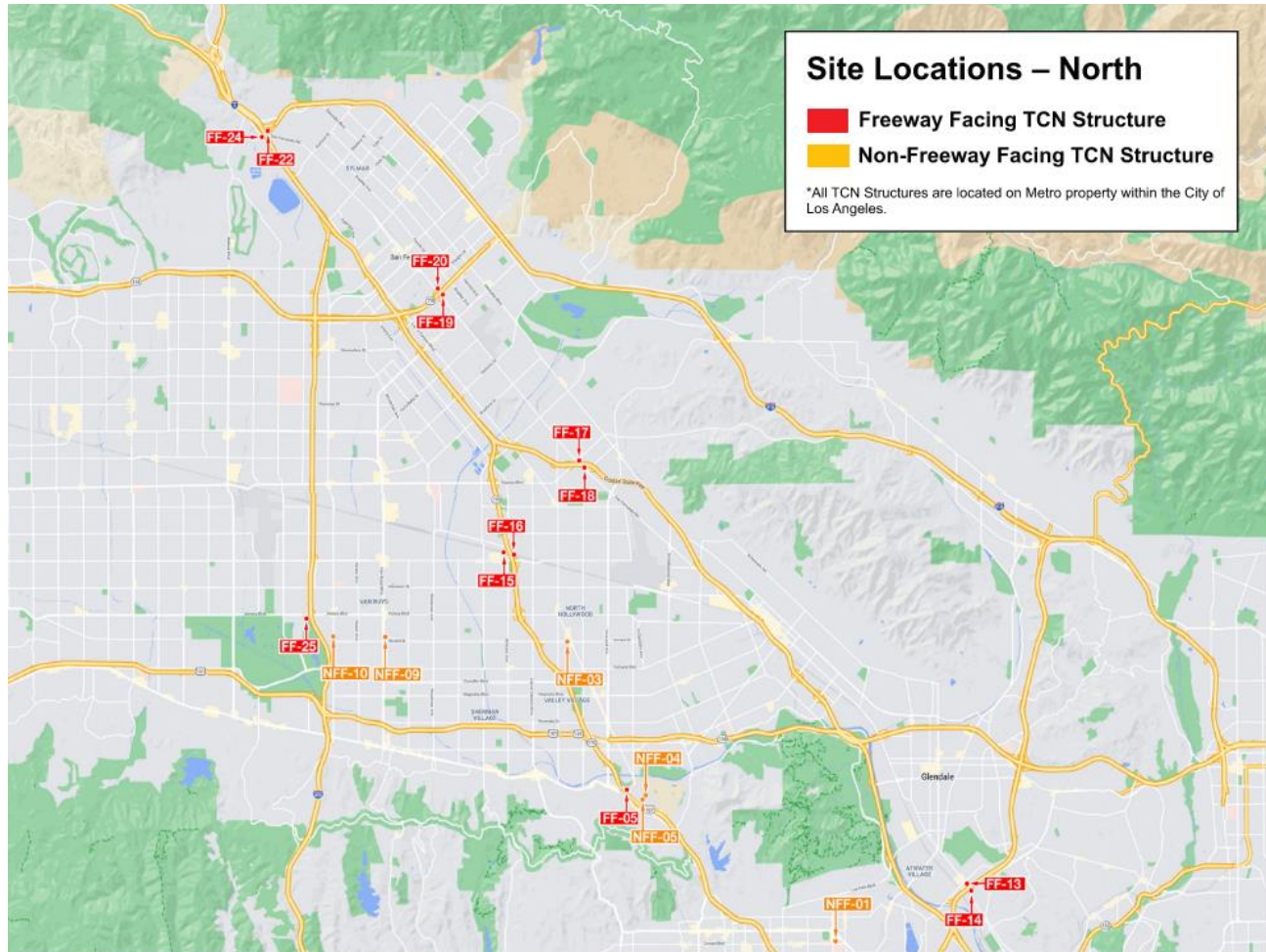


Figure 1: TCN Structure Locations Map 1

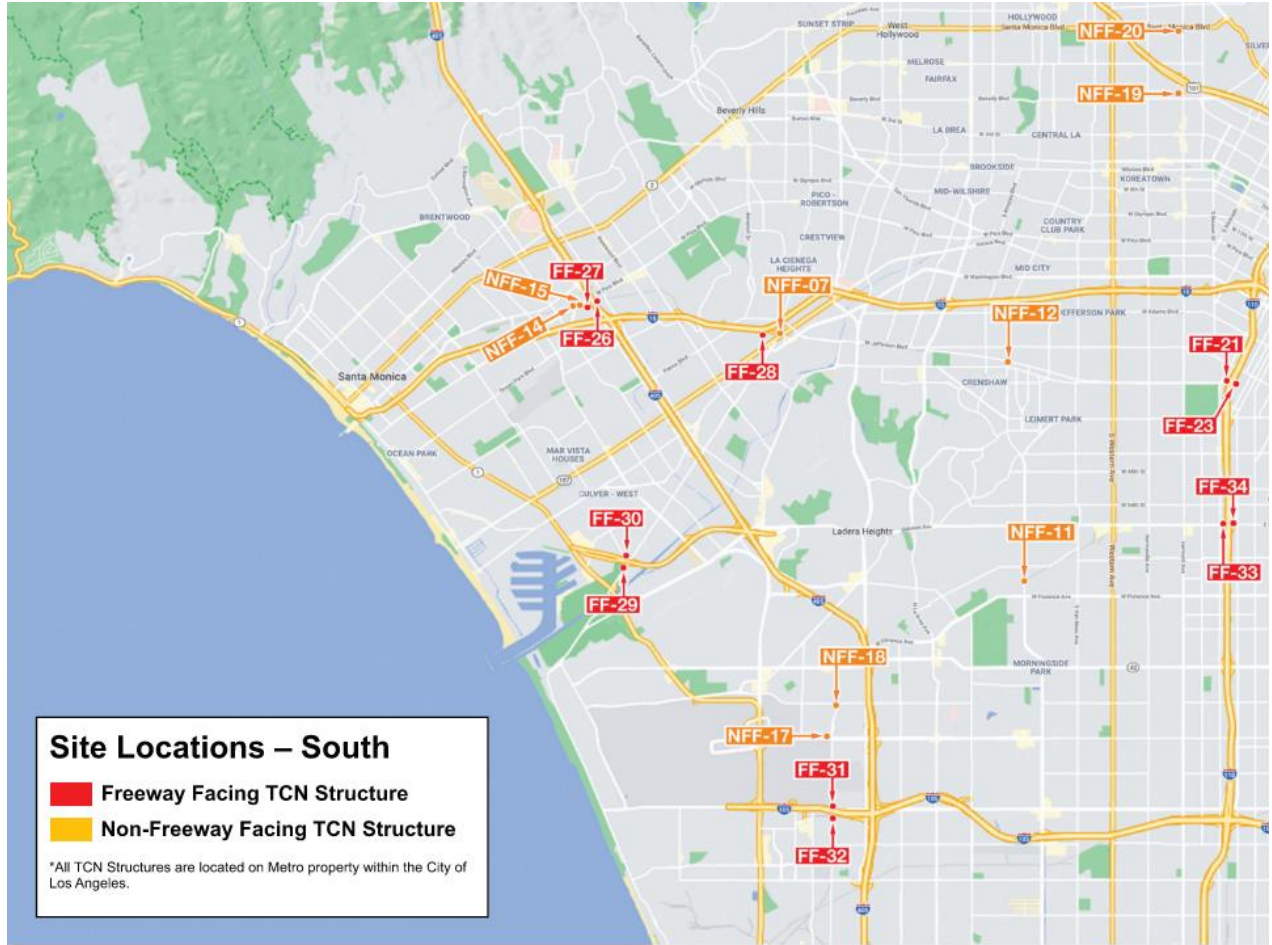


Figure 2: TCN Structure Locations Map 2

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Figure 3: TCN Structure Locations Map 3

### C. GLOSSARY OF LIGHTING TERMINOLOGY

Discussions of lighting issues include precise definitions, descriptions or terminology of the specific lighting technical parameters. The following glossary summarizes explanations of the technical lighting terms utilized in this Study and the related practice standards to facilitate discussion of these issues. The following technical terms are defined by IESNA as ANSI/IES LS-1-21, and are used in this Study.

**Brightness:** “The attribute of a visual sensation according to which an area appears to emit more light or less light”. The magnitude of sensation results from viewing a source of light. This sensation is determined partly by the source of light and partly by the conditions of observation (context). The context establishes the state of adaptation of the eye. For example, auto head lamps appear bright at night and dim during the day, because the eye adapts to the higher brightness of daylight.

**BUG Rating:** A luminaire classification system established in *IES TM15-11*, BUG Ratings Addendum that provides for uniform assessment of the directional characteristics of illumination for exterior area lighting. BUG is an acronym composed of Backlight, Uplight, and Glare. BUG ratings are based on a zonal lumen calculations for secondary solid angles defined in *IES TM15-11*.



**Candela:** The Standard International (SI) unit of luminous intensity. One candela is one lumen per steradian (lm/sr). Candela is a measure of light energy from a source at a specific standard angle and distance. Candela (cd) is a convenient measure to evaluate output of light from a light source in terms of both the intensity of light and the direction of travel of the light energy away from the source.

**Contrast:** Calculated comparison ratio of luminance, where luminance of a subject is compared to a second luminance of an adjacent subject, or to the average luminance within the field of view of an observer. High contrast, where the ratio exceeds 30 to 1, is usually deemed uncomfortable; contrast ratios greater than of 10 to 1 are clearly visible; and contrast ratios less than 3 to 1 appear to be equal.

**Glare:** The sensation produced by luminance within the [visual field](#) that are sufficiently greater than the [luminance](#) to which the eyes are adapted to cause annoyance, discomfort, or loss in [visual performance](#) or [visibility](#). *Note:* The magnitude of the sensation of glare depends on such factors as the size, position and luminance of a source; the number of sources; and the luminance to which the eyes are adapted.

Glare is visual discomfort experienced from high luminance or high range of luminance. For exterior environments at night, glare occurs when the range of luminance in a visual field is too large. The light energy incident at a point is measured by a scale of footcandles or lux, and is described in the technical term Illuminance. This incident light is not visible to the eye until it is reflected from a surface, such as pavement, wall, dust in the atmosphere or the surface of a light bulb. The visible brightness of a surface is measured in footlamberts (or metric equivalent candelas per square meter) and is described by the term Luminance.

The human eye processes brightness variations across a very broad spectrum of intensities. The range of brightness generated by direct noon sun versus a moonlight evening is over 5000 to 1. Human eyes are capable of accommodating to this range of intensities given adequate time to adjust. However, the eye cannot process brightness ratios of more than 30 to 1 within a view without discomfort. See ANSI/IES, LS-6-20 Lighting Science: Calculation of Light and Its Effects, 10.2 Calculating Glare.

For the purpose of this analysis, brightness of light sources may be described subjectively by the following criteria:

**High Contrast Conditions:** View of light fixture emitting surface, such as a lens, reflector, or lamp, where brightness contrast ratio exceeds 30 to 1 (source Luminance to background Luminance ratio in footlamberts).

**Medium Contrast Conditions:** Brightly lighted surfaces where contrast ratio exceeds 10 to 1, but is less than 30 to 1 (lighted surface Luminance to background Luminance ratio in footlamberts).

**Low Contrast Conditions:** Illuminated surfaces where contrast ratio exceeds 3 to 1, but less than 10 to 1 (source Luminance to background Luminance ratio in footlamberts).

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**Illuminance:** The areal density of the luminous flux incident at a point on a surface. Illuminance is the means of evaluating the density of Luminous Flux. Illuminance indicates the amount of Luminous Flux from a light source falling on a given area. Illuminance is measured in footcandles (fc) which is the lumens per square foot, or Lux (lumens per square meter). Illuminance need not necessarily be related to a real surface since it may be measured at any point within a space. Illuminance is determined from the Luminous intensity of the light source. Illuminance of a point source decreases with the square of the distance from the light source (see Inverse Square Law definition).

**Horizontal Illuminance:** Illuminance incident upon a horizontal plane. The orientation of the illuminance meter or calculation point will be 180° from Nadir.

**Vertical Illuminance:** Illuminance incident upon a vertical plane. The orientation of the illuminance meter or calculation point will be 90° from Nadir.

**Inverse Square Law:** In physics, an inverse-square law is any physical law stating that a specified physical quantity or intensity is inversely proportional to the square of the distance from the

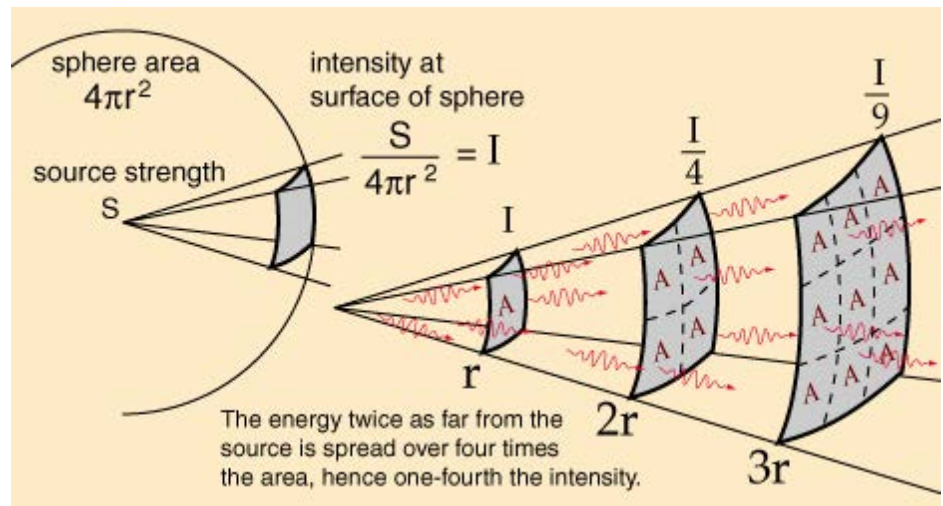


Figure 4: Inverse square law diagram ([hyperphysics.phy-astr.gsu.edu](http://hyperphysics.phy-astr.gsu.edu))

source of that physical quantity. The fundamental cause for this relationship can be understood as geometric dilution corresponding to point-source radiation into three-dimensional space (see Figure 4). The divergence of a vector field which is the resultant of radial inverse-square law fields with respect to one or more sources is everywhere proportional to the strength of the local sources, and hence zero outside sources. Newton's law of universal gravitation follows an inverse-square law, as do the effects of electric, magnetic, light, sound, and radiation phenomena. Thus, Illuminance decreases with the square of the distance from the light source.

**Output Direction:** Lighting products for outdoor use are classified by the extent of total light energy emitted by direction: above or below horizontal, front, or back.

**Light Source:** Device which emits light energy from an electric power source.

- Light trespass:** Electric light from subject property incident onto adjacent properties, measured in footcandles or lux, usually analyzed by measurement at or near the adjacent property line.
- Lighting Zone (LZ):** Defined by IESNA and adopted by CALGreen.
- Lighting Zone LZ2:** Outdoor areas of human activity where the vision of human residents and users is adapted to moderate light levels. Lighting is not uniform or consistent. Lighting is generally desired for safety, security and/or convenience.
- Lighting Zone LZ3:** Outdoor 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.
- Lighting Zone LZ4:** Outdoor areas of human activity where the vision of human residents and users is adapted to high light levels. Lighting is generally desired for safety, security and/or convenience.
- Lumen (lm):** “SI unit of [luminous flux](#). Radiometrically, it is determined from the radiant power (see *luminous flux*). Photometrically, it is the luminous flux emitted within a unit solid angle (one steradian) by a point source having a uniform [luminous intensity](#) of one [candela](#).”
- Luminance:** Luminance is a measure of emissive or reflected light from a specific surface in a specific direction over a standard area. Luminance is measured in footlamberts (fL) ( $1/\pi$  candela per square foot) or  $\text{cd}/\text{m}^2$  (candela per square meter),  $1\text{fL} = 3.43 \text{cd}/\text{m}^2$ .
- Luminance:** “The quotient of the [luminous flux](#) at an element of the surface surrounding the point, and propagated in directions defined by an elementary cone containing the given direction, by the product of the solid angle of the cone and the area of the orthogonal projection of the element of the surface on a plane perpendicular to the given direction. The luminous flux may be leaving, passing through, and/or arriving at the surface.”
- Luminance is a measure of emissive or reflected light from a specific surface in a specific direction over a standard area. Luminance is measured in footlamberts (fL) ( $1/\pi$  candela per square foot) or  $\text{cd}/\text{m}^2$  (candela per square meter).  $1\text{fL} = 3.43 \text{cd}/\text{m}^2$ .
- Whereas Illuminance indicates the amount of Luminous Flux falling on a given surface, Luminance describes the brightness of an illuminated or luminous surface. Luminance is defined as the ratio of luminous intensity of a surface (candela) to the projected area of this surface ( $\text{m}^2$  or  $\text{ft}^2$ ).
- Luminous Flux:** Mean value of total candelas produced by a light source. Luminous Flux describes the total amount of light emitted by a light source, units Lumen (lm).

This radiation could basically be measured or expressed in watts. This does not, however, describe the optical effect of a light source adequately, since the varying spectral sensitivity of the eye is not taken into account. To include the spectral

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sensitivity of the eye the Luminous Flux is measured in lumen. Radiant Flux or 1 W emitted at the peak of the spectral sensitivity (in the photopic range at 555 nanometers produces a Luminous Flux of 683 lumen). The unit of lumen does not define direction.

### Monitoring Sites:

Locations adjacent to the Project sites selected for observation and measurement to evaluate the visual field from the sensitive use properties to the Project sites to determine the extent and intensity of existing light sources within and surrounding the Project sites. The Monitoring Sites are within the public right of way, and may be adjacent to sensitive use sites. These locations are representative of the view to a specific Project site from the vicinity of the sensitive sites surrounding the Project to the north, south, east and west. Figure below illustrates the Monitoring Site locations.

### Skyglow:

“The brightening of the night sky that results from the scattering and reflection of light from the constituents of the atmosphere (gaseous molecules and aerosols), in the direction of the observer. Skyglow has two separate components: natural sky glow and artificial sky glow.” Natural causes of skyglow include sunlight reflected from the surface of the earth and moon, sunlight illuminating the upper atmosphere, and visible illumination from other interplanetary sources. Human made causes of skyglow include electric light that is emitted directly upward into the sky (uplight), or reflected off of the ground.

### Visual Field:

“The locus of objects or points in space that can be perceived when the head and eyes are kept fixed.” In this Study existing and future lighting conditions are evaluated within the visual field from an observer’s position at the Monitoring Sites to the Project site.

## D. REVIEW OF LIGHTING REGULATIONS & REFERENCE STANDARDS

Exterior lighting is regulated throughout California by the local municipal code and the state energy and building codes. Pertinent lighting sections are summarized and discussed for the City of Los Angeles, California Municipal Code (LAMC), the California Vehicle Code, the State of California Green Building Code, and the California Energy Code (CALGreen). Reference standards include model lighting ordinances provided by the Illuminating Engineering Society of North America (IESNA) and the International Dark Sky Organization, ASHRAE 90-75, and the U.S. Green Building Council. Various aspects of these reference standards are included in local regulations to improve the outcomes of any approved project and avoid future disputes or legal challenges to proposed lighted signs. The lighting standards summarized below balance the requirements of property owners for sufficient brightness and flexibility for the use of the signs, with minimizing the off-site negative effects of light trespass and glare.

### 1. Los Angeles Municipal Code

The LAMC regulates outdoor lighting with respect to light trespass (i.e., the spillover of light onto adjacent light-sensitive properties). The City also enforces the building code requirements of the Los Angeles Building Code, the California Building Code, the California Green Building Standards Code (CALGreen), and the California Electrical Code.

The LAMC includes the following sections pertaining to illumination:

Chapter 1, Article 4.4, Sec. 14.4.4 E: E.: “Sign Illumination Limitations. No sign shall be arranged and illuminated in a manner that will produce a light intensity of greater than three foot candles above ambient lighting, as measured at the property line of the nearest residentially zoned property.”

In this Study the standards above apply to Sign Lighting where Signs are adjacent to residential use properties.

## 2. California Code of Regulations, Title 24

Title 24 of the California Code of Regulations (CCR), also known as the California Building Standards Code, includes regulations for all exterior lighting throughout the State of California, including requirements related to outdoor sign lighting. The 2019 California Code of Regulations, Title 24, includes the regulations which mandate limits to light trespass and glare at any new sign or building property line or center line of adjacent transportation right of way according to the outdoor lighting zones adopted by CEC. However, the CEC grants exceptions to Signs which comply with the energy use and lighting controls requirements within CEC Sections 130.0 following requirements regarding outdoor light pollution, which pertain to outdoor sign lighting.

California Green Building Code, Chapter 5, paragraph 5.106.8, Light Pollution reduction stipulates compliance with the California Energy Code for Lighting Zones 0-4 for light trespass and Backlight, Uplight, and Glare as per IES TM-15-11. However, Exception 1 allows for exclusion as noted in Section 140.7.

**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 0-4 as defined in Chapter 10, Section 10-114 of the *California Administrative Code*; and
2. Backlight (B) ratings as defined in IES TM-15-11 (shown in Table A-1 in Chapter 8);
3. Uplight and Glare ratings as defined in *California Energy Code* (shown in Tables 130.2-A and 130.2-B in Chapter 8) and
4. Allowable BUG ratings not exceeding those shown in Table 5.106.8 [N], 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*.

SECTION 140.7 PRESCRIPTIVE REQUIREMENTS FOR OUTDOOR LIGHTING includes the following requirements.

- (a) An outdoor lighting installation complies with this section if it meets the requirements in Subsections (b) and (c), and the actual outdoor lighting power installed is no greater than the allowed outdoor lighting power calculated under Subsection (d). The allowed outdoor lighting shall be calculated according to outdoor lighting zone in Title 24, Part 1, Section 10-114.

Exceptions to Section 140.7(a): When more than 50 percent of the light from a luminaire falls within one or more of the following applications, the lighting power for that luminaire shall be exempt from Section 140.7:

...

7. Lighting of signs complying with the requirements of Sections 130.3 and 140.8.”

The Project includes lighting control systems which demonstrate compliance with Sections 130.3 and 140.8. Therefore, the Project is within the exceptions to Section 140.7(a), and therefore qualifies as an exception to the light trespass and glare requirement defined in Section 5.106.8 above.

The CEC sections that apply to the Signs are included below to define the required lighting controls to qualify as an exception within Section 140.7.

“California Energy Code (Title 24, Part 6)



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### Section 141.0 ADDITIONS, ALTERATIONS AND REPAIRS TO EXISTING NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, ... AND TO INTERNALLY AND EXTERNALLY ILLUMINATED SIGNS

Additions, alterations, and repairs to existing ... 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)...

Section 100.0 Scope, (d) Outdoor lighting and indoor and outdoor signs. The provisions of Part 6 apply to outdoor lighting systems and to signs located either indoors or outdoors as set forth in Table 100.0-A. ...

Table 100.0 - A APPLICATION OF STANDARDS

OCCUPANCIES	APPLICATION	MANDATORY	PRESCRIPTIVE	PERFORMANCES	ALTERATIONS/ ADDITIONS
Signs	Indoor and Outdoor	110.9, 130.0, 130.3	140.8	N.A.	141.0, 141.0(b)2H

”...

and paragraph 6 page 3, states:

“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.”

The requirements of SECTION 110.9, MANDATORY REQUIREMENTS FOR LIGHTING CONTROLS stipulate the type and method of outdoor lighting control systems and the types and methods of daylight sensors required for Signs to provide automatic reduced sign lighting after sunset and before sunrise.

The requirements of SECTION 130.0 LIGHTING SYSTEMS AND EQUIPMENT, AND ELECTRICAL POWER DISTRIBUTION SYSTEMS – GENERAL, include the following pertaining to outdoor signs:

“(a) The design and installation of all lighting systems and equipment in nonresidential, high-rise residential, hotel/motel buildings, outdoor lighting, and electrical power distribution systems within the scope of Section 100.0(a), shall comply with the applicable provisions of Sections 130.0 through 130.5.”

SECTION 130.3 SIGN LIGHTING CONTROLS, includes the following section that pertains to outdoor signs:

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

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.

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.”

SECTION 140.8 PRESCRIPTIVE REQUIREMENTS FOR SIGNS ....

Maximum allowed lighting power.

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.

Alternate lighting sources. The sign shall comply if it is equipped only with one or more of the following light sources: ....

Light emitting diodes (LEDs) with a power supply having an efficiency of 80 percent or greater”

The Signs comply with the exceptions to Section 140.7(a), and therefore qualifies as an exception to the light trespass and glare requirement defined in Section 5.106.8 above. Therefore the CEC light trespass and glare limits do not apply to the

Signs, and this Study does not further analyze the Project's light trespass or glare with respect to the CEC requirements for outdoor lighting.

### **3. 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 1-1/2 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 field of view 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 footlamberts or less, the measured brightness of the light source in footlambert shall not exceed 500 plus 100 times the angle, in degrees, between the driver's field of view and the light source.

### **4. IESNA Recommended Practices**

The Illuminating Engineering Society of North America (IESNA) produces illumination research and engineering standards which are widely recognized and accepted as best practices for the science of lighting research, lighting terminology definitions, and the methods of analysis and application of illumination engineering.

The IESNA reference publications include American National Standards Institute (ANSI)/Illuminating Engineering Society (IES) ANSI/IES OL-IM-03 Lighting Design Criteria and Illumination Recommendations, which provides definitions of lighting science and lighting applications; ANSI/IES LP-11-20 Environmental Considerations for Outdoor Lighting which provides definition of light trespass and glare; and ANSI/LP 2-20 Designing Quality Lighting for People in Outdoor Environment, which summarizes research of light affects on human health at night and provides guidelines for environmental regulations for outdoor lighting. These publications are the most recent supplements to the the IESNA 10th Edition Lighting Handbook.

IES LP-11-20 defines outdoor lighting zones which describe the extent of human activity at night versus natural habitat (see Appendix C of this Study) for a range of existing lighting conditions, from low or no existing lighting to high light levels in urban areas. Lighting zones are included in CEC as noted above in relation to allowable energy use for outdoor lighting. In addition, the IESNA 10th Edition Lighting Handbook defines recommended light trespass limits in Table 26.5, included in the Appendix D hereto, relative to the Outdoor Lighting Zones. The recommended light trespass illuminance limits define the maximum light trespass values in lux at the location where trespass is under review.

The existing conditions surrounding the Development are best described as Lighting Zone 3. IESNA Table 26.5, lists a Pre-curfew 8 Lux (0.74 footcandles) maximum at the location where trespass is under review for Zone 3.

In this Study, the IESNA recommendations are included in the methods of analysis for light trespass and glare at sensitive use properties.

### **E. SIGNIFICANCE THRESHOLD**

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 City of Los Angeles uses the Appendix G "questions" as its significance thresholds. The question that pertains to light trespass and glare is as follows:

Would the project:

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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 in this Study 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 Property and affect adjacent residential use properties or other sensitive use locations.

Specifically, the Project would create a significant impact with regard to artificial light or glare if:

- Light trespass illuminance from the Project at night exceeds 3.0 fc at a residential use property (LAMC Chapter 1, Article 4.4, Sec. 14.4.4 E: "Sign Illumination Limitations"), and therefore adversely changes the nighttime ambient light level at residential properties.
- Light trespass illuminance from the Project at night exceeds 3.0 fc at sensitive use properties such as hotel or hospital use properties with nighttime occupancy.
- Or, the Project creates glare with new high contrast conditions, with luminance greater than 300 cd/m<sup>2</sup> or contrast ratio greater than 30:1 at night, visible from a field of view from a residential use property or other sensitive use property.
- Or, the Project creates glare effects on drivers of motor vehicles (California Vehicle Code), where maximum brightness of the Project Sign within 10 degrees from the driver's normal field of view is greater than 1,000 times the minimum measured brightness in the driver's field of view, or when the minimum measured brightness in the field of view is 10 footlamberts or less, the measured brightness of the light source in footlambert exceeds 500 plus 100 times the angle, in degrees, between the driver's field of view and the light source.<sup>1</sup>

## F. METHODOLOGY

The methods of analysis utilized for this Study are based upon the recommended practices established by the Illuminating Engineering Society of North America (IESNA) and as published by American National Standards Institute (ANSI)/Illuminating Engineering Society (IES) for the practice of illumination engineering design and application, and the actual measurements of light sources and illuminated surfaces. IESNA reference publications include: American National Standards Institute (ANSI)/Illuminating Engineering Society (IES) OL-IM-01 Lighting Fundamentals, Metrics and Calculations; ANSI/IES OL-IM-02 Lighting Design, Engineering, and Specifications; ANSI/IES OL-IM-03 Lighting Design Criteria and Illumination Recommendations; and ANSI/IES OL-IM-04 Lighting Equipment Testing Procedures and Measurements. The ANSI/IES Standards replace the IESNA 10<sup>th</sup> Edition Handbook, which superseded the 9th Edition IESNA Handbook and various Recommended Practice (RP) References published by IESNA prior to 2011.

### 1. Existing Conditions Procedures

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<sup>1</sup> The driver's field of view from the center of the roadway plus 10 degrees."

Existing conditions lighting observations were conducted following recommended practice procedures defined by the IESNA in RP-33-00 Lighting for Outdoor Environments, TM10-00 Addressing Obtrusive Light (Urban Sky Glow and Light trespass) in Conjunction with Roadway Lighting, and TM11-00 Light trespass: Research, Results and Recommendations. Field illuminance and luminance measurements were conducted to accurately document all existing incident and visible light at each Monitoring Site location. Incident light can be understood as a vector of luminous flux moving through space. As the vector (light) is incident upon a surface, the intensity of the resulting illuminance will vary depending upon the relative orientation of the vector to the surface. The greatest illuminance will result when the surface and vector are perpendicular. The least illuminance will result when the surface and vector are parallel. In the field conditions, where there are multiple sources of light originating from varied positions, illuminance measurements are recorded horizontally with the photosensor facing up at 3 feet above grade, and vertically with the photosensor facing the Project, as per IESNA standards. These measurements document the total illuminance received at a Monitoring Site as well as the direction and intensity of light converging on the Monitoring Site from the direction of the Project Site. Since all Monitoring Sites are located at a long distance away from each Project Site, greater than 50 feet as noted in Table 3 below, the vertical illuminance represents a plane perpendicular to the light sources. Under these conditions, there is little difference between the vertical and perpendicular plane, and the vertical plane analysis that is conducted in this Study would be equal to or greater than the measured luminance from a precisely perpendicular plane analysis. Therefore, this study utilizes a vertical illuminance analysis. The existing Illuminance is measured with a Minolta Illuminance meter.

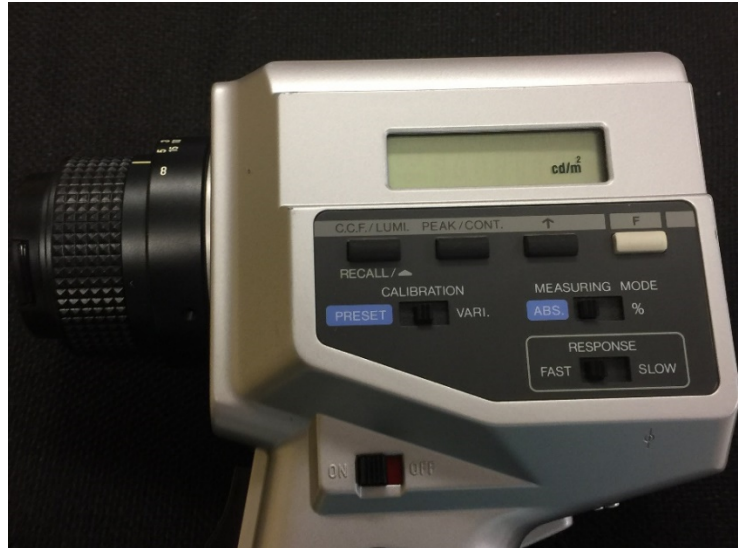


Figure 5: Minolta LS-100 meter

The existing luminance is measured at each Monitoring Site within the visual field toward the Project site from that Monitoring Site. The luminance measurements document the existing light sources and illuminated surfaces visible at the Monitoring Site within the visual field toward the Project Site. This existing conditions luminance data is measured with a Minolta LS-100 Luminance meter with procedures consistent with best practices for field measurement of luminance as per IESNA standards. The LS-100 meter utilized by Francis Krahe & Associates, Inc. reports luminance data in either candelas per square meter or footlamberts (fL). All existing luminance data measured and reported in this Study are recorded as  $\text{cd}/\text{m}^2$ .

The existing luminance is measured at each Monitoring Site within the visual field toward the Project site from that Monitoring Site. The luminance measurements document the existing light sources and illuminated surfaces visible at the Monitoring Site within the visual field toward the Project Site. This existing conditions luminance data is measured with a Minolta LS-100 Luminance meter with procedures consistent with best practices for field measurement of luminance as per IESNA standards. The LS-100 meter utilized by Francis Krahe & Associates, Inc. reports luminance data in either candelas per square meter or footlamberts (fL). All existing luminance data measured and reported in this Study are recorded as  $\text{cd}/\text{m}^2$ .

## 1.1 Monitoring Site Locations

Monitoring sites are utilized to describe and evaluate the existing lighting conditions at and surrounding the Project Sites to determine the maximum potential impacts that may result from light or glare onto adjacent sensitive sites surrounding a Project Site. All Monitoring Site locations are within close proximity of a Project Site and have views of the adjacent Project Site. Monitoring Sites may also be existing residential properties, or may be located adjacent to existing residential properties. The following criteria were used to select potential Monitoring Site locations:

**Project Light Visibility** – Monitoring sites are analyzed that provide direct view of the areas of greatest light intensity from the Project.

**Proximity** – Monitoring sites at the least distance to the Project are analyzed. These locations are selected because light intensity decreases exponentially with distance. Locations at a greater distance from the Project will experience less light intensity than nearby locations.

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Table 3: Existing Conditions Lighting Criteria

Sign	Monitoring Site	Location	Distance to Nearest Project Sign (feet)
FF-04	FF-04A	N. Boylston St.	600
	FF-04B	N. Victor St.	375
FF-08	FF-08A	Corner of Pomeroy St. and Lord St.	382
	FF-08B	Enchandia St.	1156
FF-09	FF-09A	Enchandia St.	875
	FF-09B	Mitchell Pl.	475
FF-13	FF-13A	Corner of Carillon St. and Casitas Ave.	290
FF-21	FF-21A	3584 S. Figueroa St.	280
FF-28	FF-28A	3600 Bagley Ave.	370
FF-29	FF-29A	La Villa Marina	1050
FF-32	FF-32A	11622 Aviation Blvd.	570
FF-33	FF-33A	Corner of W. 58 <sup>th</sup> St. and S. Flower St.	170
FF-34	FF-34A	Corner of W. 58 <sup>th</sup> St. and S. Grand Ave	207
NFF-20	NFF-20A	4716 Santa Monica Blvd. East Property Line	60

Appendix B shows the Sign locations and orientation, Monitoring Site locations, and properties surrounding the Project. Adjacent residential properties are shaded orange within the diagrams. Monitoring Site locations were selected for observation and field lighting measurements to evaluate the views to the Project from adjacent residential properties to determine the extent and intensity of existing light sources within and surrounding the Project. The Monitoring Sites are within the public right of way or Metro property, adjacent to residences.

The Monitoring Site locations are representative of the view to the Project from the vicinity of residential properties surrounding the Project to the north, south, east, and west. Light degrades rapidly relative to the distance from the light source (see Inverse Square Law, Section 3 above). Therefore, more distant residential sites farther away from the Project will receive substantially less light than the Monitoring Sites. Table 3 summarizes the distances from the Monitoring Site to the adjacent or nearby Project Sign. The distance from the Project Signs to the Monitoring Sites varies considerably, from 60 feet to 1156 feet.

## 1.2 Monitoring Site Criteria

As established in Section 1.3, the following factors are used to assess the existing conditions at each Monitoring Site:

Table 4: Existing Conditions Lighting Criteria at Monitoring Sites

Criteria	Metric	Procedure
Light Trespass - Illuminance	Measured illuminance (footcandle) at each Monitoring Site	Horizontal and vertical illuminance measurements at each Monitoring Site with Minolta illuminance meter.
Glare – Luminance Contrast Ratio	Measured luminance ( $\text{cd}/\text{m}^2$ ) at each Monitoring Site within field of view to a Project Site from the Monitoring Site; Observed existing conditions	Luminance measurements at each Monitoring Site with Minolta luminance meter. Observed conditions with respect to the view to the Project Site from the Monitoring Site in terms of visibility of the Project Site, light sources, lighted surfaces, and illuminated signs.

## 2. Analysis

This analysis of the Project includes evaluation of the light from the Signs at the nearest adjacent residential use properties to the Project. This analysis includes an evaluation of light trespass from the Project and evaluation of glare from the Project visible at residential use properties or at adjacent roadway locations. This Study presents a conservative analysis with respect to light trespass and glare. The Project is evaluated with a sign configuration at the maximum permissible light intensity within the limits defined by the Sign Concept Plan. This Study evaluates the Signs as identified in Appendix A.

### 2.1 Light Trespass Analysis

The light trespass analysis evaluates the Sign locations and the distance to residential use properties to determine the potential for light trespass impact. The majority of the Sign locations are within industrial or commercial use properties, within and adjacent to Metro properties and right of way, and freeway or major arterial roadways, with little or no adjacent residential use properties.

The distance to the location where the Signs may produce a light trespass impact is determined by way of the illuminance calculation software (AGI). This maximum light trespass will occur directly perpendicular to the sign face while operating at the maximum permitted night luminance ( $300 \text{ cd}/\text{m}^2$ , all white). The distance to the location where light trespass from the Sign is less than the maximum threshold is determined by the calculations presented below in Section I.1.1 Table 7. As discussed in Section H Project Lighting Analysis below, the maximum Sign light trespass under the most conservative conditions will be less than 0.3 fc at 345 feet from 30 feet x 40 feet Project Signs, less than 0.3 fc at 270 feet away from the 14 feet x 48 feet Project Signs, and less than 0.3 fc at 175 feet from from the 10 feet x 30 feet Project Signs.

The Project Site Diagrams presented in Appendix B illustrate the distance where the light trespass illuminance is 0.3 fc or less. Light degrades rapidly over distance as explained by the Inverse Square Law. Therefore, any residential properties located at distances greater than the distance illustrated in Appendix B will receive less than 0.3 fc, 10% of the LAMC maximum of 3.0 fc, and 50% less than the the IESNA threshold of 0.74fc. Therefore, any residential use properties located beyond the circumference of the circle illustrated in Appendix B will not receive significant light trespass from the Signs and do not need further study.

Sign light trespass impacts also require visibility of the Sign from the residential use property or other sensitive use site. All residential use or sensitive use properties located within the circumference illustrated in Appendix B (less than 345 feet from 30 feet x 40 feet Project Signs, 270 feet from 14 feet x 48 feet Project Signs, or 175 feet from 10 feet x 30 feet Project Signs) are evaluated to determine if the Sign is visible and to evaluate the view relative to the Sign orientation. At each property location where the Sign is visible an additional illuminance calculation is required to determine the extent of light trespass impact. Light trespass illuminance is calculated at the locations where lighting is under review through

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the illumination modeling software program AGI32. This software utilizes the 3-dimensional architectural computer model, including Sign locations, dimensions, and luminous specifications (as defined herein within Appendix A and B) to generate an accurate prediction of future illuminance from the Sign at adjacent residential use properties. Light trespass illuminance is evaluated with respect to vertical illuminance at the locations where lighting is under review.<sup>2</sup>

### 2.2 Glare Analysis

Glare from the Project<sup>3</sup> is evaluated at night at nearby residential use properties and for drivers on adjacent streets. The glare from Signs is determined by the contrast ratio, which equals the maximum sign luminance divided by the measured average existing luminance within the field of view at the Monitoring Sites identified in the field survey of existing conditions (see Section G below). Contrast ratios greater than 30:1 are considered potential glare conditions.

Glare from the Project that may impact drivers is analyzed with respect to compliance with the California Vehicle Code requirements for both night and day conditions at adjacent roadways. According to California Vehicle Code Section 21466.5, the Signs would have a significant impact with regard to artificial light or glare if:

- The maximum measured brightness of a light source within 10 degrees from a driver's normal line of sight exceeds 1,000 times the minimum measured brightness in the driver's field of view when the minimum values in the field of view are 10 footlamberts (fL) or more.
- Or, when the minimum luminance in the drivers field of view is less than 10 footlamberts (fL) the source brightness exceeds 500 fL plus 100 times the angle, in degrees, between the driver's line of sight and the light source.

The glare analysis that may impact drivers includes evaluation of the view angle at each Roadway Monitoring Site location from the driver's line of sight to the Signs, to determine the visibility of the Signs, and evaluates the maximum luminance permitted by the California Vehicle Code at that angle of view.

## G. EXISTING SITE ANALYSIS

The site surveys and the distance calculations presented in Appendix B identified ten Freeway Facing Sign locations and one Non Freeway Facing Sign location for further analysis as night. The following Project Sign site locations are evaluated by Monitoring Sites located adjacent to sensitive use properties with a potential view to the Signs: FF-04, FF-08, FF-09, FF-13, FF-21, FF-28, FF-29, FF-32, FF-33, FF-34, and NFF-20. The Project includes Signs that are illuminated as described in Appendix A. This analysis represents a conservative evaluation of the potential for offsite light trespass illuminance and glare from the Project.

### 1. Monitoring Site Survey Data

The observations and measurement of existing lighting conditions within and surrounding the Project Sites are summarized below in relation to the evaluation factors established in Section E, Significance Threshold. The existing lighting within the Project Sites varies and includes a wide range of lighting for safety and security. Lighting within each Project Site and within adjacent commercial properties and roadway lighting on the adjacent right of way contribute to the ambient lighting conditions at all Monitoring Sites.

## Illuminance:

Table 5 summarizes the existing conditions measured horizontal and vertical illuminance at the Monitoring Sites.

Table 5: Measured Illuminance (fc) at Monitoring Sites

Monitoring Site	Illuminance (fc)		Evaluation
	Horizontal	Vertical	
FF-04A	0.614	0.108	Low Horizontal Illuminance, Low Vertical Illuminance
FF-04B	0.453	0.311	Low Horizontal Illuminance, Low Vertical Illuminance
FF-08A	0.361	0.218	Low Horizontal Illuminance, Low Vertical Illuminance
FF-08B	0.023	0.235	Low Horizontal Illuminance, Low Vertical Illuminance
FF-09A	0.061	0.036	Low Horizontal Illuminance, Low Vertical Illuminance
FF-09B	0.027	0.169	Low Horizontal Illuminance, Low Vertical Illuminance
FF-13A	0.101	0.168	Low Horizontal Illuminance, Low Vertical Illuminance
FF-21A	0.098	0.190	Low Horizontal Illuminance, Low Vertical Illuminance
FF28-A	0.86	0.346	Medium Horizontal Illuminance, Low Vertical Illuminance
FF-29A	0.060	0.030	Low Horizontal Illuminance, Low Vertical Illuminance
FF-32A	0.372	0.281	Low Horizontal Illuminance, Low Vertical Illuminance
FF-33A	0.146	0.235	Low Horizontal Illuminance, Low Vertical Illuminance
FF-34A	6.580	0.443	High Horizontal Illuminance, Low Vertical Illuminance
NFF-20A	0.224	0.433	Low Horizontal Illuminance, Low Vertical Illuminance

Measured illuminance greater than 3.0 fc is evaluated as high illuminance, from 0.75 fc to 2.9 fc is evaluated as medium illuminance, and 0.74 fc or less is evaluated as low illuminance. The highest existing horizontal illuminance level was recorded at Monitoring Site at FF-34A with 6.58 fc, while the lowest horizontal illuminance was recorded at Monitoring Site FF-08B at 0.023 fc. The highest existing vertical illuminance level was recorded at Monitoring Site FF-34A at 0.443 fc, while the lowest vertical illuminance was recorded at Monitoring Site FF-29A at 0.030 fc.

Table 6 summarizes the measured luminance and presents an evaluation of contrast ratios and glare. The evaluation of High, Medium, and Low Contrast describes the perception of how bright a visible object appears to the surrounding objects within any given field of view and context. High Contrast indicates a potential glare condition for residential properties nearby. Contrast is the ratio of one surface luminance to a second surface luminance or to the field of view. Contrast exceeding 30 to 1 are usually deemed uncomfortable and evaluated as high; less than 30 to 1 but greater than 10 to 1 are medium contrast; below 10 to 1 is clearly visible and evaluated as low; and less than 3 to 1 appear to be equal, and evaluated as very low.



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Table 6: Measured Luminance, (cd/m<sup>2</sup>) at Monitoring Sites

Monitoring Site	Luminance (cd/m <sup>2</sup> )		Contrast Ratio (Max / Average)	Evaluation
	Average	Maximum		
FF-04A	144.5	2330	16:1	Medium Contrast
FF-04B	475.1	9523	20:1	Medium Contrast
FF-08A	436.9	7599	17:1	Medium Contrast
FF-08B	181.3	4490	25:1	Medium Contrast
FF-09A	162.5	2346	14:1	Medium Contrast
FF-09B	56.8	1191	21:1	Medium Contrast
FF-13A	76.1	1106	15:1	Medium Contrast
FF-21A	46.8	831	18:1	Medium Contrast
FF-28A	200.4	2004	10:1	Medium Contrast
FF-29A	10.5	98	9:1	Low Contrast
FF-32A	223.6	4370	20:1	Medium Contrast
FF-33A	398.6	5898	15:1	Medium Contrast
FF-34A	482.6	9876	21:1	Medium Contrast
NFF-20A	202.4	1907	9:1	Low Contrast

The highest average luminance was recorded at Monitoring Site FF-34A at 482.6 cd/m<sup>2</sup>, while the lowest average luminance was measured at Monitoring Site FF-29A at 10.5 cd/m<sup>2</sup>. The measured average luminances are evaluated as medium luminance (greater than 10 cd/m<sup>2</sup> and less than 500 cd/m<sup>2</sup>) at all monitoring sites except Monitoring Site FF-29A and NFF-20A, which are evaluated as low average luminance (less than 10 cd/m<sup>2</sup>).

The highest maximum luminance was recorded at Monitoring Site FF-34A with 9876.0 cd/m<sup>2</sup>, while the lowest maximum luminance was measured at Monitoring Site FF-29A at 98 cd/m<sup>2</sup>. The measured maximum luminance is higher than the Project Sign luminance (greater than 300 cd/m<sup>2</sup>) at all monitoring sites except FF-29A.

The calculated contrast ratio (maximum luminance / average luminance) varies from a minimum of 9 to 1 at Monitoring Site FF-29A and NFF-20A to a maximum of 25 to 1 at Monitoring Site FF-08B. The calculated existing contrast ratio at Monitoring Site FF-29A evaluated as low contrast (less than 10 to 1, and greater than 3 to 1). All other Monitoring Site locations are evaluated as medium contrast (less than 30 to 1, and greater than 10 to 1).



Figure 6: Freeway Facing Sign FF-04 and Monitoring Sites FF-04A and FF-04B

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### 1.1 Monitoring Site FF-04A:

Monitoring Site FF-04A is located at the end of N. Boylston St. adjacent to southbound State Route 101 Freeway, north of the FF-04 Sign Project Site. This location is used to evaluate residential use properties to the north of the FF-04 Sign Project Site. The distance to the Project Site north boundary is approximately 600 feet. Prominent light sources visible within the field of view to the Project Site include street lighting, lighting from freeway signage, downtown building lighting and night sky glow from surrounding area.



Figure 7: Monitoring Site FF-04A day image. November 30, 2021 4:55 pm



Figure 8: Monitoring Site FF-04A night. November 30, 2021 6:15 pm

## 1.2 Monitoring Site FF-04B:

Monitoring Site FF-04B is located at the end of N. Victor St. adjacent to northbound State Route 101 Freeway, northwest of the FF-04 Sign Project Site. This location is used to evaluate residential use properties to the northwest of the FF-04 Sign Project Site. The distance to the Project Site northwestern boundary is approximately 375 feet. Prominent light sources visible within the field of view to the Project Site include freeway lighting, downtown building lighting and skyglow from surrounding area.



Figure 9: Monitoring Site FF-04B day image. November 30, 2021 5:01 pm

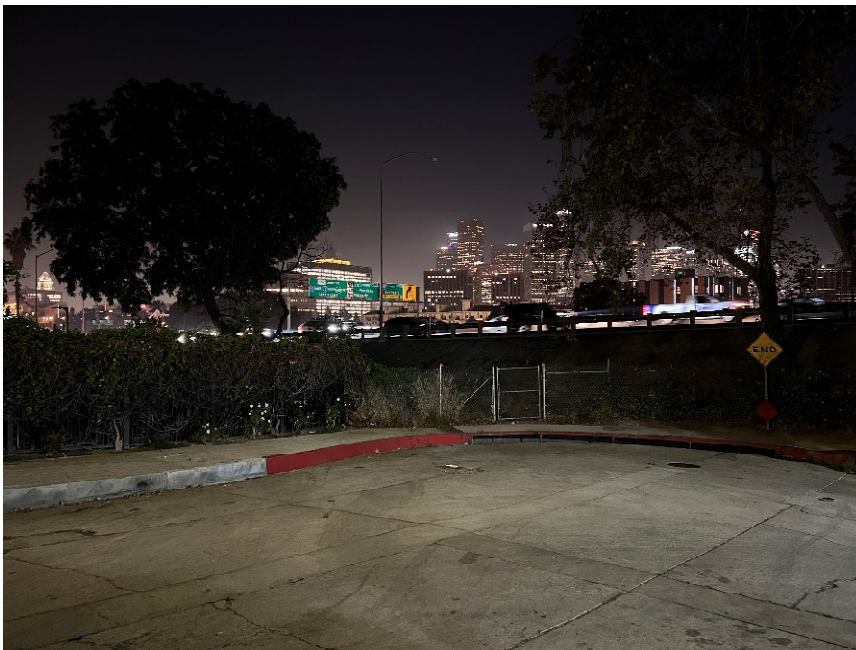


Figure 10: Monitoring Site FF-04B night image. November 30, 2021 6:25 pm

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Figure 11: Freeway Facing Sign FF-08 and Monitoring Sites FF-08A and FF-08B.

### 1.3 Monitoring Site FF-08A:

Monitoring Site FF-08A is located at the corner of Pomeroy St. and Lord St. adjacent to the State Route 5 Freeway, northeast of the FF-08 Sign Project Site. This location is used to evaluate residential use properties to the north and east of the FF-08 Sign Project Site. The distance to the Project Site northeast boundary is approximately 382 feet. Prominent light sources visible within the field of view to the Project Site include; City street lights, freeway lighting, and skyglow from surrounding area.



Figure 12: Monitoring Site FF-08A day image. November 30, 2021 5:19 pm



Figure 13: Monitoring Site FF-08A night image. November 30, 2021 6:02 pm

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### 1.4 Monitoring Site FF-08B:

Monitoring Site FF-08B is located at the end of Echandia St. adjacent to State Route 10 Freeway, southwest of the FF-08 Sign Project Site. This location is used to evaluate residential use properties to the southwest of the FF-08 Sign Project Site. The distance to the Project Site southwestern boundary is approximately 1156 feet. Prominent light sources visible within the field of view to the Project Site include freeway lighting, Metro station lighting, and city skyglow from surrounding areas.



Figure 14: Monitoring Site FF-08B day image. November 30, 2021 4:35 pm



Figure 15: Monitoring Site FF-08B night image. November 30, 2021 5:17 pm



Figure 16: Freeway Facing Sign FF-09 and Monitoring Sites FF-09A and FF-09B.



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### 1.5 Monitoring Site FF-09A:

Monitoring Site FF-09A is located at the end of Echandia St. adjacent to the State Route 10 Freeway, southeast of the FF-09 Sign Project Site. This location is used to evaluate residential use properties to the southeast of the FF09 Sign Project Site. The distance to the Project Site southeastern boundary is approximately 875 feet. Prominent light sources visible within the field of view to the Project Site include freeway lighting, Metro station lighting, and skyglow from surrounding area.



Figure 17: Monitoring Site FF-09A day image. November 30, 2021 4:35 pm



Figure 18: Monitoring Site FF-09A night image. November 30, 2021 5:27 pm

## 1.6 Monitoring Site FF-09B:

Monitoring Site FF-09B is located at the end of Mitchell Place, adjacent to the State Route 10 Freeway, southwest of the FF-09 Sign Project Site. This location is used to evaluate residential use properties to the southwest of the FF-09 Sign Project Site. The distance to the Project Site southwest boundary is approximately 475 feet. Prominent light sources visible within the field of view to the Project Site include; freeway lighting, Metro station lighting, and skyglow from surrounding area.



Figure 19: Monitoring Site FF-09B day image. November 30, 2021 5:27 pm



Figure 20: Monitoring Site FF-09B night image. November 30, 2021 5:37 pm

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Figure 21: Freeway Facing Signs FF-13 and FF-14, and Monitoring Site FF-13A

## 1.7 Monitoring Site FF-13A:

Monitoring Site FF-13A is located at the corner of Carillon St and Casitas Ave. adjacent to the State Route 2 Freeway, west of the FF-13 Sign Project Site. This location is used to evaluate residential use properties to the west of the FF13 Sign Project Site. The distance to the Project Site western boundary is approximately 290 feet. Prominent light sources visible within the field of view to the Project Site include freeway lighting, Community College campus lighting, and skyglow from surrounding area.



Figure 22: Monitoring Site FF-13A day image. December 1, 2021 4:22 pm



Figure 23: Monitoring Site FF-13A night image. December 1, 2021 5:23 pm

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Figure 24: Freeway Facing Signs FF-21 and FF-23, and Monitoring Site FF-21A

## 1.8 Monitoring Site FF-21A:

Monitoring Site FF-21A is located at the rear corner of 3584 S. Figueroa St., west of the FF-21 Sign Project Site. This location is used to evaluate residential use properties to the west of the FF-21 Sign Project Site. The distance to the Project Site western boundary is approximately 280 feet. Prominent light sources visible within the field of view to the Project Site include street lighting, traffic lighting, freeway sign lighting, and skyglow from surrounding area.



Figure 25: Monitoring Site FF-21A day image. December 2, 2021 3:39 pm



Figure 26: Monitoring Site FF-21A night image. December 2, 2021 6:07 pm

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Figure 27: Freeway Facing Sign FF-28 and Monitoring Site FF-28A

## 1.9 Monitoring Site FF-28A:

Monitoring Site FF-28A is located at 3600 Bagley Ave. and Exposition Boulevard, adjacent to State Route 10 Freeway, west of the FF-28 Sign Project Site. This location is used to evaluate residential use properties to the west of the FF-28 Sign Project Site. The distance to the Project Site western boundary is approximately 370 feet. Prominent light sources visible within the field of view to the Project Site include street lighting, metro train lighting, and skyglow from surrounding area.



Figure 28: Monitoring Site FF-28A day image. December 6, 2021 2:57 pm



Figure 29: Monitoring Site FF-28A night image. December 6, 2021 6:34 pm



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Figure 30: Freeway Facing Sign FF-29 and Monitoring Site FF-29A

### 1.10 Monitoring Site FF-29A:

Monitoring Site FF-29A is located at the end of La Villa Marina adjacent to 4808 LaVilla Marina, west of the FF-29 Sign Project Site. This location is used to evaluate residential use properties to the west of the FF-29 Sign Project Site. The distance to the Project Site western boundary is approximately 1050 feet. Prominent light sources visible within the field of view to the Project Site include distant freeway lighting, and city skyglow from surrounding area. The land to the east of this site is part of Ballona Wetlands Ecological Reserve and there are no existing lights on this land.



Figure 31: Monitoring Site FF-29A day image. December 6, 2021 3:19 pm



Figure 32: Monitoring Site FF-29A night image. December 6, 2021 5:56 pm

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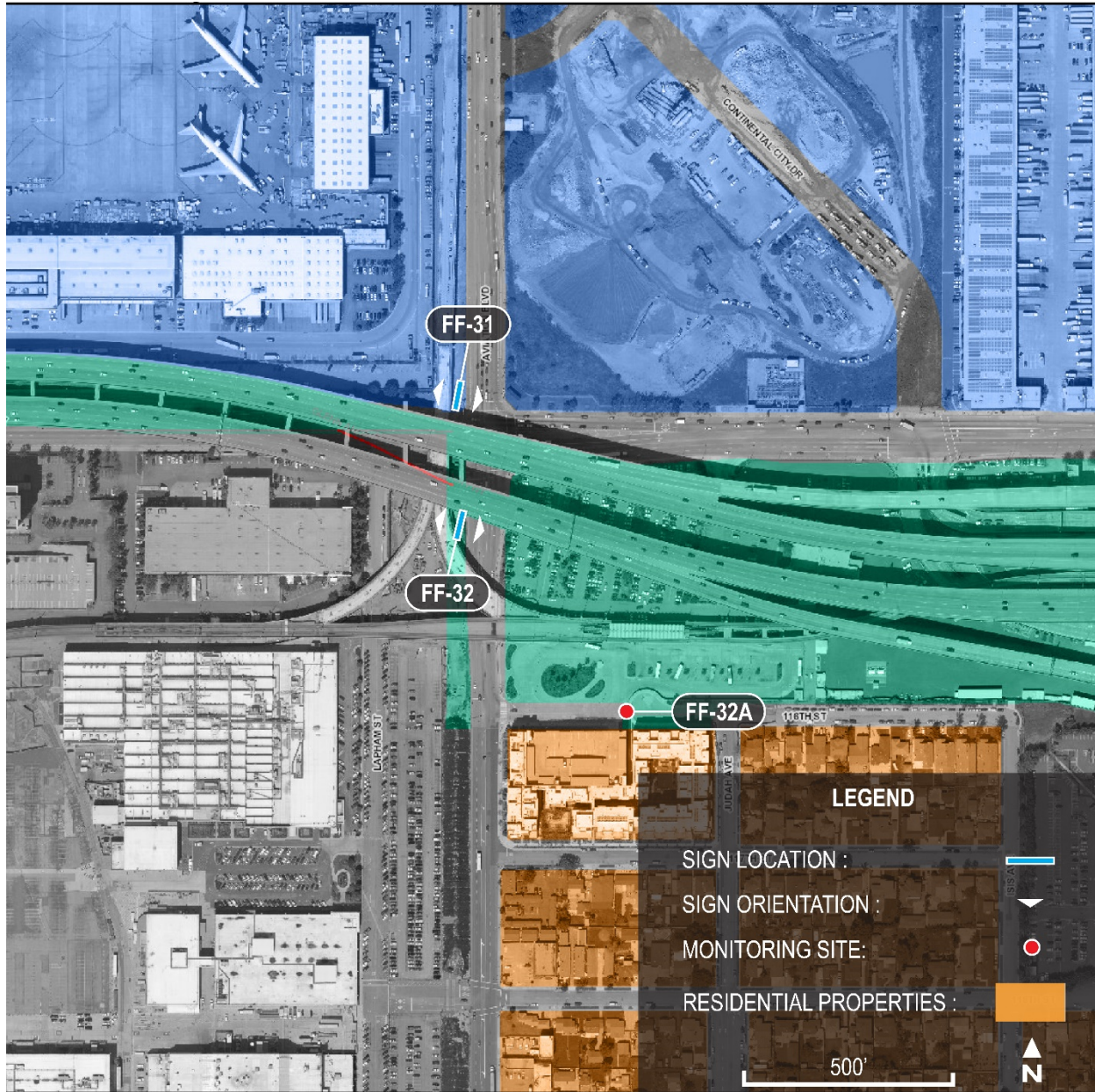


Figure 33: Freeway Facing Signs FF-31 and FF-32, and Monitoring Site FF-32A

### 1.11 Monitoring Site FF-32A:

Monitoring Site FF-32A is located at 11622 Aviation Blvd., southeast of the FF-32 Sign Project Site. This location is used to evaluate residential use properties to the southeast of the FF-32 Sign Project Site. The distance to the Project Site southeastern boundary is approximately 570 feet. Prominent light sources visible within the field of view to the Project Site include Metro station lighting, and city skyglow from surrounding area.



Figure 34: Monitoring Site FF-32A day image. December 6, 2021 3:38 pm



Figure 35: Monitoring Site FF-32A night image. December 6, 2021 5:29 pm

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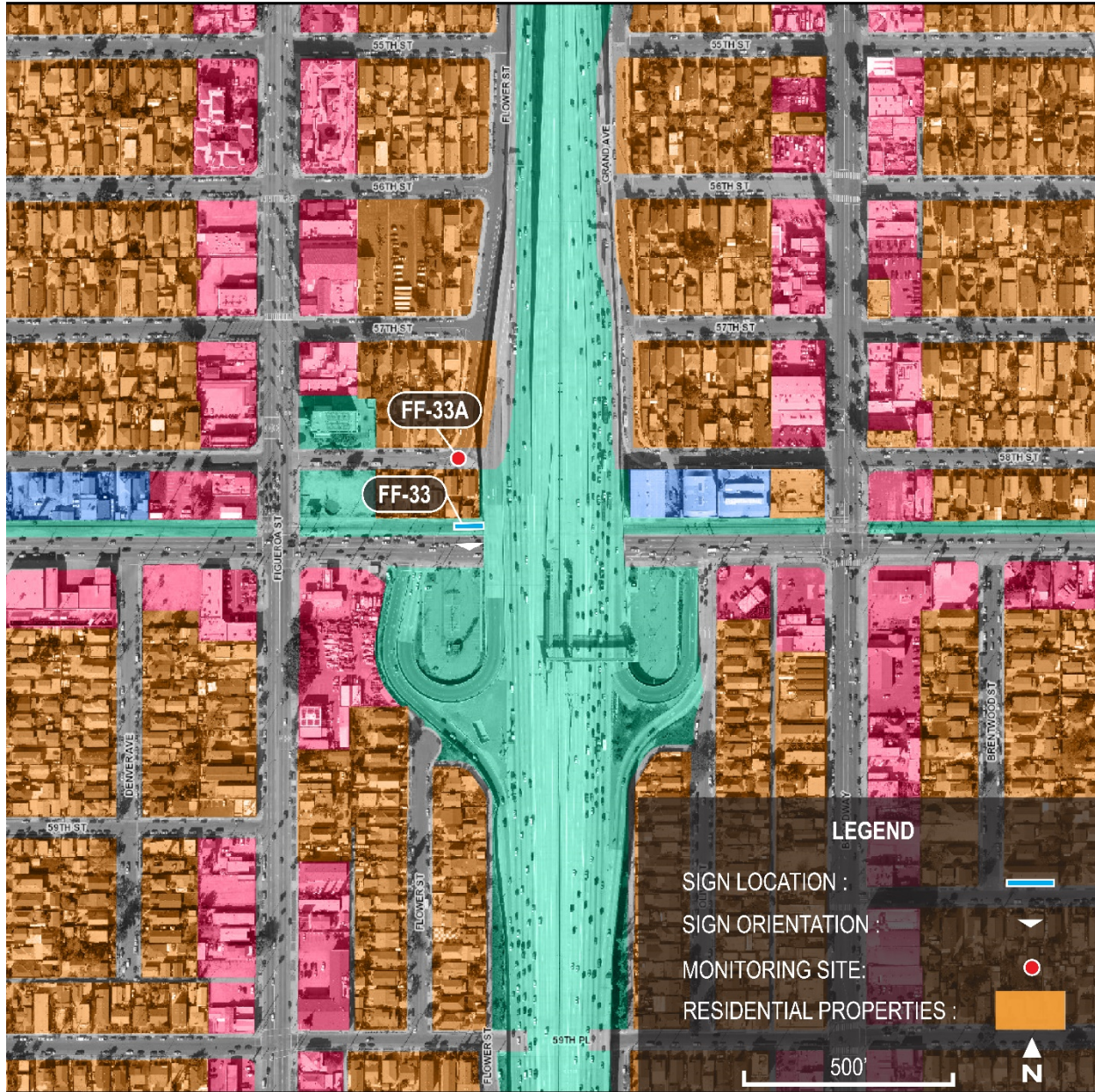


Figure 36: Freeway Facing Sign FF-33 and Monitoring Site FF-33A

## 1.12 Monitoring Site FF-33A:

Monitoring Site FF-33A is located at the corner of W. 58th St., and S. Flower St., adjacent to State Route 110 Freeway, north of the FF-33 Sign Project Site. This location is used to evaluate residential use properties to the north of the FF-33 Sign Project Site. The distance to the Project Site northern boundary is approximately 170 feet. Prominent light sources visible within the field of view to the Project Site include residential porch lighting, street lighting on Slauson Ave., and skyglow from surrounding area.



Figure 37: Monitoring Site FF-33A day image. December 2, 2021 3:55 pm



Figure 38: Monitoring Site FF-33A night image. December 2, 2021 5:39 pm

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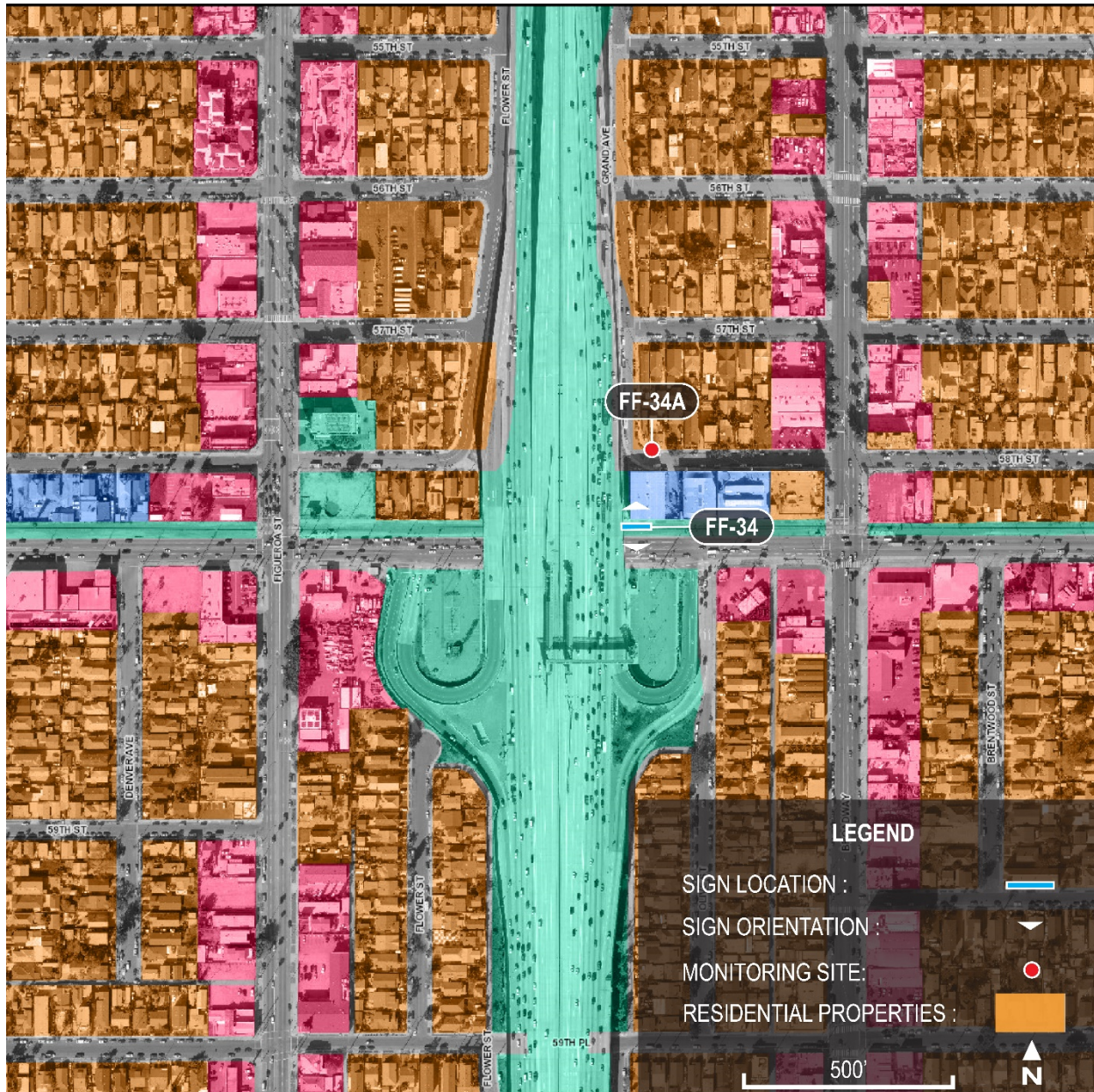


Figure 39: Freeway Facing Sign FF-34 and Monitoring Site FF-34A

### 1.13 Monitoring Site FF-34A:

Monitoring Site FF-34A is located at the corner of W. 58th St., and S. Grand Ave., adjacent to the State Route 110 Freeway, north of the FF-34 Sign Project Site. This location is used to evaluate residential use properties to the north of the FF-34 Sign Project Site. The distance to the Project Site northern boundary is approximately 207 feet. Prominent light sources visible within the field of view to the Project Site include, large flood light from corner of 58th and Grand Avenue aimed at the street and the adjacent commercial property, skyglow from surrounding area is visible.



Figure 40: Monitoring Site FF-34A day image. December 2, 2021 4:03 pm



Figure 41: Monitoring Site FF-34A night image. December 2, 2021 5:24 pm



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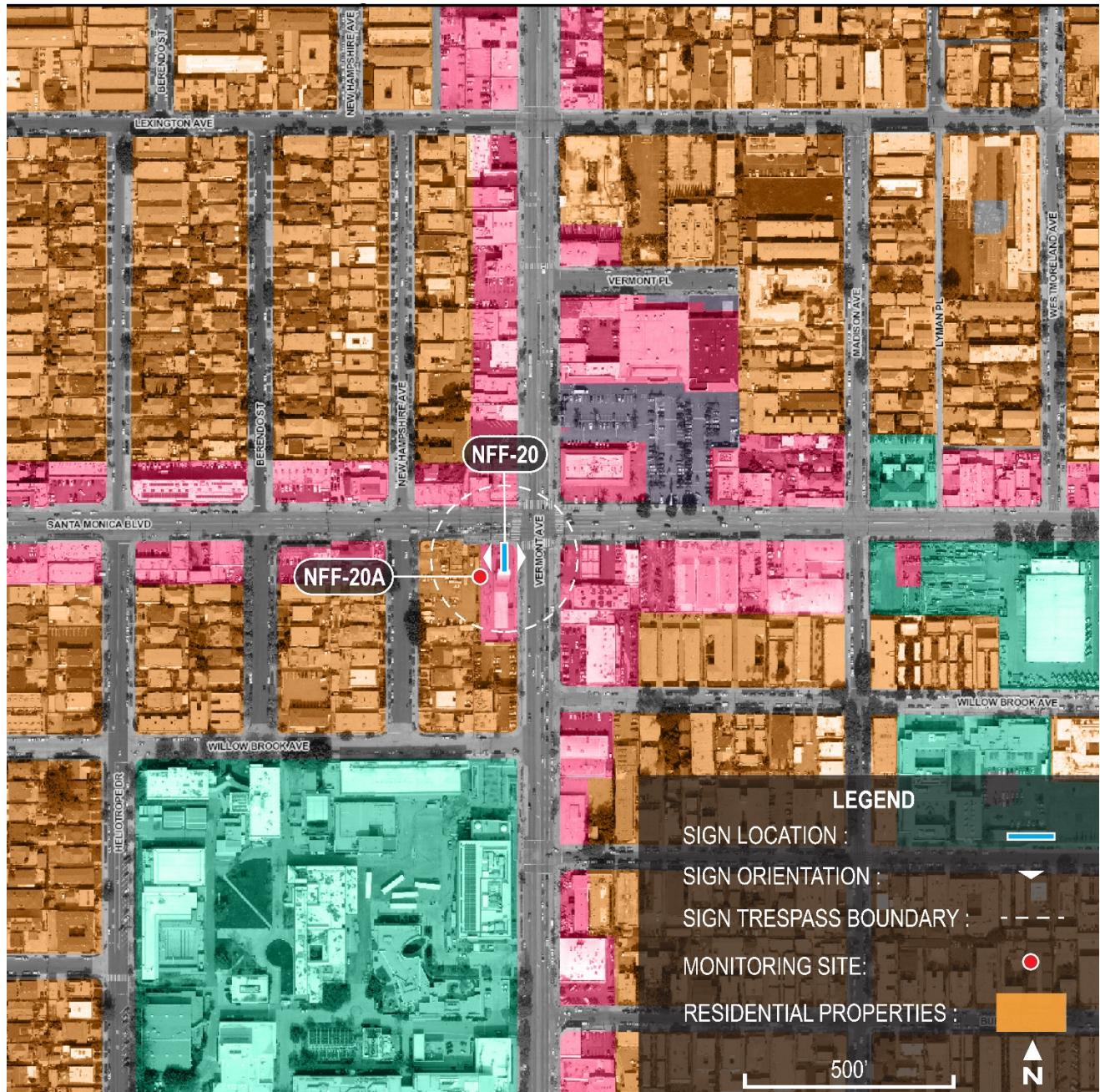


Figure 42: Freeway Facing Sign NFF-20 and Monitoring Site NFF-20A

#### 1.14 Monitoring Site NFF-20A:

Monitoring Site NFF-20A is located within the Metro property adjacent to the east property line of 4716 Santa Monica Blvd., and approximately 30' south of the Santa Monica right-of-way. This location is used to evaluate future residential use property currently under construction immediately to the west of the NFF-20 Project Sign. The distance to the Project Site northern boundary is approximately 60 feet. Prominent light sources visible within the field of view to the Project Site include streetlights and stoplights at the intersection of Vermont Ave. and Santa Monica Blvd., building lighting, and illuminated signage.



Figure 43: Monitoring Site NFF-20A day image. August 23, 2021 9:40 am



Figure 44: Monitoring Site NFF-20 Night Image. August 22, 2021 8:48 pm

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### H. PROJECT LIGHTING ANALYSIS

The analysis of the Project includes evaluation of the light trespass illuminance from the Project at adjacent residential use properties, and an evaluation of glare from the Project visible at residential use properties or at adjacent roadway locations. This Study analyzes Signs within the proposed Project Sites for both light trespass illuminance and glare.

This Study presents a conservative analysis with respect to light trespass and glare. The Project Sign Lighting presented in Appendix A is evaluated with Signs operating at the maximum luminance, all white.

#### 1. Light Trespass Analysis

Light trespass illuminance is evaluated at all Sign locations at the nearest, adjacent residential use properties. The Signs are located within Metro properties adjacent to freeways and arterial streets, and adjacent to commercial or industrial properties. There is no light trespass impact at commercial or industrial properties and the majority of the Sign locations are more than 1000 feet from the nearest adjacent residential property. Light degrades exponentially with distance (see Inverse Square Law above). Therefore, residential properties more distant from the Signs receive much less light than locations close to the Signs. Sign locations are analyzed to determine the locations where residential properties are within a distance where light trespass may be significant. Light trespass for a Prototypical Sign is calculated to determine the critical distance where light trespass is significant. Sign locations where the distance to the nearest residential properties are greater than the Prototypical Sign critical distance will not receive light trespass illuminance that exceeds the thresholds defined in Section E above, and therefore will not create an impact. Sign locations where residential properties are less than the Prototype critical distance are further evaluated by a detailed analysis to determine if the Sign is oriented toward the residential use property, if the Sign is visible at the residential properties, and the amount of light trespass illuminance.

Light trespass illuminance is calculated with respect to vertical illuminance at the locations where lighting is under review through the illumination modeling software program AGI32. This software utilizes the Project three-dimensional computer model to generate an accurate prediction of future Project illuminance from the Sign Lighting identified within the Sign Concept Plan (Appendix A). The calculated illuminance data is presented at 10 feet on center within a vertical planar surface, extending from grade to the maximum height of the Project, which is 200 feet above grade, at the distance from the Sign where the light trespass is analyzed. The calculation planes simulate the illumination (fc) captured by light meters.

This Study evaluates light trespass illuminance for Sign Lighting as regulated by the LAMC as noted above in Section D.

#### 1.1 Prototype Sign Light Trespass Illuminance Analysis

The light trespass illuminance from any Project Sign is evaluated to determine a conservative standard distance where Sign light trespass illuminance would be far below the thresholds established above in Section E, for the standard Sign dimensions and luminance of the Freeway Facing Signs and Non Freeway Facings Signs, defined in Appendix A. This conservative distance is applied as the first level of evaluation of the 34 Freeway Facing Sign locations and the 22 Non Freeway Facing Sign locations to determine the extent of residential use properties near to the Sign locations where light trespass illuminance would be potential. Light decreases exponentially as the distance increases from the Sign<sup>4</sup>. Therefore, residential use properties located farther away from the Project Signs will receive exponentially less light than locations near to the Signs. The Prototype Sign illuminance calculation determines a conservative distance from the Signs to exclude any potential impact at residential use properties located at greater distances.

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<sup>4</sup> Inverse Square Law

Light trespass is calculated by the illumination modeling software program AGI32, which utilizes a 3-dimensional architectural computer model, including the sign dimensions and luminous specifications (as defined herein within Appendix A) to generate an accurate prediction of future illuminance. As described in Light Trespass Analysis Methodology, the maximum possible illuminance is consistent for all Signs of the same size and luminance.

The Prototype Sign Light Trespass illuminance calculations determine the distance from the Sign where the Sign illuminance has decreased to less than the light trespass threshold. Three distances are determined for each Sign Type and Sign area, corresponding to the maximum illuminance permitted by the regulatory standards identified in Section E above: the maximum illuminance permitted by LAMC (3.0 fc); the maximum illuminance permitted by CALGreen (0.74 fc); and 10% of the maximum illuminance permitted by LAMC (0.3 fc). The distances where Sign light trespass illuminance is at or less than the LAMC, CALGreen, and 10% LAMC are presented in Table 7 for Freeway Facing Signs with dimensions of 30 feet by 40 feet and 14 feet by 48 feet, and for Non Freeway Facing Signs with dimensions of 14 feet by 48 feet, and 10 feet by 30 feet. Each prototypical sign is double sided and individually calculated. The Prototype Sign light trespass analysis defines a conservative distance to evaluate the potential for Project Signs to create a light trespass impact.

*Table 7: Project Sign Maximum Light Trespass Illuminance*

<b>Sign Type<sup>5</sup></b>	<b>Sign Dimensions (feet)</b>	<b>LAMC 3.0 fc</b>	<b>CAL Green 0.74 fc</b>	<b>10% LAMC 0.3 fc</b>
Freeway Facing Sign FF-01	30' x 40'	110'	225'	345'
Freeway Facing Signs FF-02 through FF-34	14' x 48'	80'	170'	270'
Non Freeway Facing Signs NFF-08, NFF-17, and NFF-18	14' x 48'	80'	170'	270'
Non Freeway Facing Signs NFF-01 through NFF-07, NFF-09 through NFF-16, and NFF-19 through NFF-22	10' x 30'	55'	115'	175'

All residential use properties located more than 110 feet from Freeway Facing Sign FF-01, or 80 feet from Freeway Facing Signs FF-02 through FF-34 will receive less than 3.0 fc from the Signs. Similarly, all residential use properties located more than 225 feet from Freeway Facing Sign FF-01, or 170 feet from Freeway Facing Signs FF-02 through FF-34 will receive less than 0.74 fc. All residential properties located more than 345 feet from Freeway Facing Sign FF-01, or 270 feet from Freeway Facing Signs FF-02 through FF-34 will receive less than 0.3 fc from the Signs. Therefore, a conservative evaluation of the Freeway Facing Project Sites will include an analysis of any residential use property located less than 345 feet from Freeway Facing Sign FF-01, or less than 270 feet from Freeway Facing Signs FF-02 through FF-34.

Freeway Facing Sign FF-01 with dimensions of 30 feet x 40 feet generates light trespass illuminance of 0.3 fc or less at a distance of 345 feet or more from the Sign. Therefore, residential properties located at distances greater than 345 feet from Freeway Facing Sign FF-01 will receive less than 0.3 fc, or less than 10% of the maximum 3.0 fc permitted by LAMC, and cannot possibly receive light from the Freeway Facing Sign FF-01 that would exceed the threshold or cause a light trespass impact. Freeway Facing Sign FF-01 located more than 345 feet from a residential or sensitive use property will not create an impact.

Freeway Facing Signs FF-02 through FF-34 with dimensions of 14 feet x 48 feet generate light trespass illuminance of 0.3 fc or less at a distance of 270 feet or more from the Sign. Therefore, residential properties located at distances greater than 270 feet from Freeway Facing Signs FF-02 through FF-34 will receive less than 0.3 fc, or less than 10% of the maximum

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<sup>5</sup> See Appendix A

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3.0 fc permitted by LAMC, and cannot possibly receive light from the Freeway Facing Signs that would exceed the threshold or cause a light trespass impact. Freeway Facing Signs NFF-02 through FF-34 located more than 270 feet from a residential use or sensitive use property will not create an impact.

All residential use properties located more than 80 feet from Non Freeway Facing Signs NFF-08, NFF-17, and NFF-18 and 55 feet from Non Freeway Facing Signs NFF-01 through NFF-07, NFF-09 through NFF-16, and NFF-19 through NFF-22 will receive less than 3.0 fc from the Signs. All residential use properties located more than 170 feet from Non Freeway Facing Signs NFF-08, NFF-17, and NFF-18, and 115 feet from Non Freeway Facing Signs NFF-01 through NFF-07, NFF-09 through NFF-16, and NFF-19 through NFF-22 feet will receive less than 0.74 fc. All residential use properties located more than 270 feet from Non Freeway Facing Signs NFF-08, NFF-17, and NFF-18, and 175 feet from Non Freeway Facing Signs NFF-01 through NFF-07, NFF-09 through NFF-16, and NFF-19 through NFF-22, will receive less than 0.3 fc. Therefore, a conservative evaluation of the Non Freeway Facing Project Sites will include an analysis of any residential or sensitive use property located less than 270 feet from Non Freeway Facing Signs NFF-08, NFF-17, and NFF-18, or less than 175 feet from NFF-01 through NFF-07, NFF-09 through NFF-16, and NFF-19 through NFF-22. Non Freeway Facing Signs NFF-08, NFF-17, or NFF-18 located more than 270 feet from a residential or sensitive use property will not create an impact. Non Freeway Facing Signs NFF-01 through NFF-07, NFF-09 through NFF-16, and NFF-19 through NFF-22 located more than 175 feet from a residential or sensitive use property will not create an impact.

Non Freeway Facing Signs NFF-08, NFF-17, and NFF-18 with dimensions of 14 feet x 48 feet generate light trespass illuminance of 0.3 fc or less at a distance of 270 feet or more from the Sign. Therefore, residential properties located at distances greater than 270 feet from Non Freeway Facing Signs NFF-08, NFF-17, or NFF-18 will receive less than 0.3 fc, or less than 10% of the maximum 3.0 fc permitted by LAMC, and cannot possibly receive light from the Non Freeway Facing Signs that would exceed the threshold or cause a light trespass impact. Non Freeway Facing Signs NFF-08, NFF-17, and NFF-18 located more than 270 feet from a residential or sensitive use property will not create an impact.

Non Freeway Facing Signs NFF-01 through NFF-07, NFF-09 through, NFF-16, and NFF-19 through NFF-22 with dimensions of 10 feet x 30 feet generate light trespass illuminance of 0.3 fc or less at a distance of 175 feet or more from the Sign. Therefore, residential properties located at distances greater than 175 feet from Non Freeway Facing Signs NFF-01 through NFF-07, NFF-09 through NFF-16, and NFF-19 through NFF-22 will receive less than 0.3 fc, or less than 10% of the maximum permitted by LAMC, and cannot possibly receive light that would exceed the threshold or cause a light trespass impact. Non Freeway Facing Signs NFF-01 through NFF-07, NFF-09 through NFF-16, and NFF-19 through NFF-22 located more than 175 feet from a residential or sensitive use property will not create an impact.

## 1.2 Sign Location Analysis

Appendix B includes a map of each Sign location with a graphic overlay of a circle, and the radius of the circle is the distance identified in Table 7 from the corresponding Freeway Facing or Non Freeway Facing Signs to the location where light trespass illuminance equals 0.3 fc (10% of LAMC). The radius depicts the relationship of this dimension from the Sign location where light trespass has decreased to 10% of the threshold relative to the surrounding properties, including the locations of residential use properties or other sensitive use locations such as hospital patient rooms or hotels. For Sign locations where the residential or sensitive use properties are located beyond the circle circumference, there is no light trespass impact, and no further analysis is included in this Study. Where the graphic overlay includes residential use properties within the circumference of the circle, the Sign is further evaluated to determine the visibility of the Sign at the residential or sensitive use properties and precise light trespass illuminance at these properties. Project Site locations where residential use properties are located within the circle circumference and the dimension to the property is less than the dimensions identified in Table 7, indicates a potential for a light trespass impact. Each of these Sign locations are evaluated below.

Table 8: Residential Use Properties Analysis

<b>Sign</b>	<b>Sector Map (See Appendix B)</b>	<b>Distance To Nearest Residential or Sensitive Use (ft)</b>	<b>Visibility Analysis</b>
FF-13	10	265	Visible from residential property. Further Analysis Required
FF-21	30	295	Hotel and adjacent residential property are located more than 270 feet from the Sign, therefore light trespass is less than 0.30 fc.
FF-26	27	125	Visible from residential property. Further Analysis Required
FF-28	28	125	Visible from residential property. Further Analysis Required
FF-29	33	113	Visible from residential property. Further Analysis Required
FF-30	33	229	Visible from residential property. Further Analysis Required
FF-33	33	170	Sign oriented to south, visible from residential property to the south. Further Analysis Required
FF-34	31	167	Visible from residential property. Further Analysis Required
NFF-01	11	165	Sign orientation is east & west, therefore existing buildings obstruct view of NFF-01 from residential buildings to the northeast of the Project Site and Hospital Patient Facilities to the east and west of the Project Site. No Further Analysis Required.
NFF-15	27	130	Commercial use building located south of NFF-15 and north of the nearest residential use, block all view of NFF-15 from the residential properties. No Further Analysis Required.
NFF-20	25	60	Visible to future residential properties uses located directly west of the NFF-20. Further Analysis Required.

Residential properties located less than 345 feet from Freeway Facing Sign FF-01 or 270 feet from Freeway Facing Signs FF-02 through FF-34 may receive light trespass illuminance if the Sign is oriented toward the residential use property, if the Sign is visible at the residential property, and if there are no obstructions between the Sign location and the residential property which could block the Sign illumination. Residential properties located less than 270 feet from Non Freeway Facing Signs NFF-08, NFF-17, or NFF-18, or located less than 175 feet from Non Freeway Facing Signs NFF-01 through NFF-07, NFF-09 through NFF-16, or NFF-19 through NFF-22, may receive light trespass illuminance if the Sign is oriented toward the residential use property, if the Sign is visible at the residential property, and if there are no obstructions between the Sign location and the residential property which could block the Sign illumination. Table 8 summarizes the Project Sign locations where there are residential use sites located near the Signs at distances less than the dimensions in Table 7. For each Project Sign location in Table 8 the visibility of the Sign from the residential use property is evaluated from the field survey data and site photos to determine if the Sign is visible and if further study of the Sign is necessary. Residential properties located within the dimensions in Table 7 where the Sign is not visible from the residential use property do not

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require further study since obstructions which block visibility will also block any light trespass illuminance. Residential use properties located at distances less than the minimum distances in Table 7, where the Signs are fully or partially visible, are further evaluated by detailed light trespass calculations. Sign light trespass illuminance calculations are provided for seven Freeway Facing Signs listed in Table 8 (FF-13, FF-26, FF-28, FF-29, FF-30, FF-33, and FF-34) because these Signs are visible from the residential use properties identified within the Figures in Appendix B. Non Freeway Facing Signs NFF-01 and NFF-15, identified in Table 8, are not visible from the nearby residential use properties due to obstructions or commercial properties and require no further analysis. Therefore, there is no light trespass impact at Signs NFF-01 and NFF-15. Sign light trespass illuminance calculations are provided for Non Freeway Facing Sign NFF-20 since it is visible from the nearby residential use properties.

Sign FF-21 is also evaluated due to the hotel use property located less than 300 feet from the Sign as noted in Appendix A. Sign FF-21 is located 295 feet from the hotel property line to the west of the Sign, which is greater than the 270 feet distance to 0.3 fc identified in Table 7. Therefore, the Freeway Facing Sign FF-21 light trespass illuminance will be less than 0.3 fc at the hotel property line, which indicates there is no light trespass impact at the hotel property line.

Sign NFF-01 is further evaluated due to the hospital use properties located less than 300 feet from the Sign. Sign NFF-01 is located 165 feet from the hospital property line which is less than the 175 feet distance to 0.3 fc identified in Table 7. Therefore, the Non Freeway Facing Sign NFF-01 light trespass illuminance will be greater than 0.30 fc, but substantially less than the threshold of 3.0 fc which occurs at 80 feet from the Sign. Furthermore, the view of the Sign from the adjacent hospital property is obstructed by the office and lab buildings adjacent to the Project Site. Therefore there is no light trespass impact at the hospital property locations near Sign NFF-01,

### 1.3 Sign Illuminance Calculation Analysis

Sign illuminance is calculated for each Sign location identified in Table 8 requiring further analysis, at the corresponding nearby residential property line. The illuminance is evaluated as per the methodology defined in Section F above, at the vertical calculation plane locations at the residential property lines where the Sign is visible. Sign light trespass calculations accurately analyze the precise Sign illuminance at these residential properties located near to the Signs. Table 9 below summarizes the results of the Sign light trespass illuminance calculations at the adjacent residential property lines. As defined within Appendix A, the Signs would operate at maximum luminance of 300 cd/m<sup>2</sup> at night.

The light trespass analysis evaluates the illuminance (fc) from the Signs toward adjacent residential use properties in comparison to the maximum light trespass limit of 3.0 fc defined by LAMC. The analysis in this Study is conservative, as it assumes that the Signs would operate at the maximum luminance of 300 cd/m<sup>2</sup>, with all white light. In addition, the calculated light trespass is cumulative, and includes all nearby signs (within 1000 feet of any location). Complete trespass illuminance calculated data is presented in Appendix E.

Table 9 : Sign Light Trespass Illuminance (fc)

Sign	Sector Map (See Appendix B)	Vertical Plane	Illuminance (fc)	LAMC Analysis (3.0 fc threshold)
			Max Vertical	
FF-13	10	VP-13A	0.30	Less than threshold
FF-26	27	VP-26A	0.20	Less than threshold
FF-28	28	VP-28A	0.10	Less than threshold
	28	VP-28B	0.20	Less than threshold
FF-29 & FF-30	33	VP-29A	0.60	Less than threshold
FF-33	31	VP-33A	0.10	Less than threshold
	31	VP-33B	0.10	Less than threshold
FF-34	31	VP-34A	0.50	Less than threshold
	31	VP-34B	0.20	Less than threshold
NFF-14	27	VP-14A	0.00	Less than threshold
NFF-15	27	VP-15A	0.10	Less than threshold
NFF-20	25	VP-20A	2.50	Less than threshold

The maximum calculated vertical illuminance in Table 9 varies from a minimum of 0.0 fc at vertical plane VP-14A to a maximum of 2.5 fc at vertical plane VP-20A. The vertical light trespass illuminance at all vertical planes is below the 3.0 fc limit established by LAMC and therefore does not present a significant light trespass impact at the locations where light trespass is calculated. All residential properties further from the signs will receive exponentially less light trespass (see Inverse Square Law). Therefore, the proposed Signs do not introduce a light trespass impact at any residential use properties.

The light trespass illuminance from the Signs is less than the LAMC limit of 3.0 fc at all residential use properties. Therefore, the Signs would not create a new significant of light trespass impact.

The cumulative impact of multiple adjacent Signs at nearby residential properties is evaluated by way of a detailed light trespass illumination calculation to confirm multiple signs will not exceed the threshold and cause an impact. Sector 27 map in Appendix B identifies the location with the highest quantity of Signs and calculation plane locations utilized for the cumulative impact analysis. Signs within Sector 27 map are less than the distances defined in Table 7 from residential use properties and there are multiple Signs within close proximity to each other. Freeway Facing Signs FF-26 and FF-27, and Non Freeway Facing Signs NFF-14, and NFF-15 are evaluated for cumulative light trespass illuminance. This Study presents a conservative evaluation of the cumulative impact because all other Freeway Facing Signs and Non Freeway Facing Signs are located farther from adjacent Signs, and or farther from residential properties. Cumulative light trespass illuminance calculation data is presented below in Table 9 corresponding to Signs FF-26, FF-27, NFF-14 and NFF-15. All calculated



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cumulative light trespass illuminance at the location where the largest quantity of signs exists is less than the maximum permitted by LAMC and will therefore not create a light trespass impact.

## 2. Glare Analysis

Glare from the Project is evaluated at adjacent residential properties and for drivers on adjacent streets and freeways. Project Sign Lighting luminance is evaluated by the contrast ratio, which equals the maximum Project luminance divided by the measured average existing luminance within the visual field as measured at the Monitoring Sites identified in the field survey of existing conditions (see Section G above). Contrast ratios greater than 30:1 are considered potential glare conditions.

Table 10 below compares the measured existing background luminance at the monitoring sites to the luminance of the Signs to calculate the contrast ratio.

Table 10: Project Sign Contrast

Monitoring Site	Existing Luminance	Project Lighting Luminance		Evaluation
	Average	Max	Contrast Ratio	
FF-04A	144.5	300	2 : 1	Low Contrast Ratio, No Glare Impact
FF-04B	475.1	300	1 : 1	Low Contrast Ratio, No Glare Impact
FF-08A	436.9	300	1 : 1	Low Contrast Ratio, No Glare Impact
FF-08B	181.3	300	2 : 1	Low Contrast Ratio, No Glare Impact
FF-09A	162.5	300	2 : 1	Low Contrast Ratio, No Glare Impact
FF-09B	56.8	300	5 : 1	Low Contrast Ratio, No Glare Impact
FF-13A	76.1	300	4 : 1	Low Contrast Ratio, No Glare Impact
FF-21A	46.8	300	6 : 1	Medium Contrast Ratio, No Glare Impact
FF-28A	200.4	300	1 : 1	Low Contrast Ratio, No Glare Impact
FF-29A	10.5	300	28 : 1	Medium Contrast Ratio, No Glare Impact
FF-32A	223.6	300	1 : 1	Low Contrast Ratio, No Glare Impact
FF-33A	398.6	300	1 : 1	Low Contrast Ratio, No Glare Impact
FF-34A	482.6	300	1 : 1	Low Contrast Ratio, No Glare Impact
NFF-20A	202.4	300	1 : 1	Low Contrast Ratio, No Glare Impact

The highest contrast occurs at monitoring site FF-29A with calculated contrast ratio of 28:1. This represents a medium contrast condition (greater than 10:1 but less than 30:1). All other contrast ratios presented in Table 10 are evaluated at as low contrast conditions (less than 10:1). The calculated Sign contrast ratios at all monitoring sites are less than the threshold of 30:1 and therefore the Project Signs will not cause a new significant source of Glare.

Luminance is independent of distance for large area sources, such as illuminated signs, where the viewing locations are relatively close to the sign and the sign fills a large portion of the field of view. At viewing locations less than 19 times the height or width of the illuminated surface, the sampled area viewed or measured by a luminance meter increases with distance, cancelling the inverse square losses. The standard meter for luminance measurement utilizes a 3 degree lens, thus the 3 degree view translates to approximately 19.1 times the height or width dimension. At viewing locations beyond 19 times the height or width the illuminated surface becomes a point source, and the inverse square relationship will again predict the measured luminance or perceived brightness. The Project includes signs with a range of sizes. The Conceptual Sign Plans includes signs with variations in dimensions and area, and a range of viewing distances up to and greater than 1000 feet. The luminance of the largest signs within the Project are analyzed with a constant luminance of 300 cd/m<sup>2</sup> for all viewing distances up to 1,000 feet

## 2.1 Roadway Glare Analysis

In addition, the potential roadway glare impacts are analyzed with respect to the Project luminance compliance with the California Vehicle Code requirements for night, twilight, and day conditions.

The Project's lighting effect on a driver's visibility is evaluated by way of the methodology discussed above at the center line of the driver's field of view and at angles wider than the center line of the driver's field of view. Bright sources within the driver's field of view, from the centerline of the roadway to angles up to 90 degrees from the center line of the roadway, may create glare if the light source is brighter than the limits established by the CVC. As summarized below, the results of this Study demonstrate that the maximum Project luminance is less than the limits established by the CVC for excessive luminance, or glare, during night, twilight (sunset and sunrise) and during the day. Accordingly, the Project luminance is far below the maximum permitted luminance by the CVC requirements for roadways approaching the Signs from all directions.

The roadway glare analysis evaluates the maximum Sign luminance during night, twilight, and day with respect to the most stringent requirements of the CVC to determine if the Project creates distracting glare to drivers. As defined in Appendix A, the maximum Sign luminance at night and during twilight in all white mode is 300 cd/m<sup>2</sup>, and the maximum Sign luminance during the day is 6000 cd/m<sup>2</sup>, in all white mode.

The most stringent condition contained within the CVC Section 21466.5, states: "except that when the minimum measured brightness in the field of view is 10 footlamberts or less, the measured brightness of the light source in footlamberts (fL) shall not exceed 500 plus 100 times the angle, in roadway degrees, between the driver's field of view and the light source." Thus, a conservative evaluation occurs where a Sign is visible within the centerline of a driver's field of view, the angle noted above within the field of view is 0, the surrounding surface luminance is less than 10 fL, and therefore the maximum allowable luminance is 500 fL. Therefore, the most conservative condition at night or at twilight evaluates the Sign maximum luminance in comparison to the maximum permitted luminance defined by CVC, which is 500 fL.

A measured brightness within the drivers field of view of less than 10 fL occurs at night when the maximum Sign luminance is 300 cd/m<sup>2</sup>, which converts to english units from metric units as 87.6 fL. The Sign maximum luminance would not exceed 87.6 fL, which is 17.5% of the 500 fL CVC maximum, which is the most conservative limit provided by the CVC for conditions where the minimum brightness in the driver's field of view is less than 10 fL. Therefore, at night, the Signs within the driver's field of view would not exceed 500 fL and, therefore, would not introduce a new source of glare as defined by the CVC Section 21466.5.

For Signs located beyond the driver's 10 degree field of view, the maximum luminance is permitted to increase under the CVC. For example, light sources located 15 degrees from the centerline of the driver's field of view are limited to a

## Metro TCN Lighting Study

maximum of 1,000 fL (500 fL plus 100 times the angle (5 degrees) = 1,000 fL). The maximum Sign luminance at night is 300 cd/m<sup>2</sup> or 87.6 fL, or less than approximately 8.8% of the maximum allowed by the CVC for Signs located at 15 degrees from the center of the driver's field of view. Therefore, at night, the Signs beyond the driver's 10 degree field of view would not exceed the 1000 fL and would not introduce a new source of glare as defined by the CVC Section 21466.5.

The Signs are evaluated during twilight (the transition period from day to night, from sunset to 45 minutes after sunset, and from 45 minutes before sunrise to sunrise). Sunlight increases gradually from the minimum brightness during the night to maximum brightness at mid-day, and then decreases gradually to the minimum brightness after sunset during the night. The minimum ambient luminance from sunlight occurs 45 minutes after sunset or later, until at least 45 minutes before sunrise. During evening twilight, from sunset and for 45 minutes thereafter, the ambient sunlight will be greater than the minimum values at night due to the light from the setting sun. And during morning twilight, from 45 minutes prior to sunrise until sunrise the minimum luminance will be greater than the minimum luminance during the night due to the rising sun. This Study applies the CVC minimum light criteria for night conditions (10 fL) during twilight, extending the duration of minimum sunlight, to present a conservative evaluation of glare. Therefore, the maximum luminance during twilight permitted by the CVC is 500 fL, which equals 1,579 cd/m<sup>2</sup>.

The Sign luminance will not exceed 300 cd/m<sup>2</sup> (87.6 fL), from sunset to sunrise. At 45 minutes prior to sunset the Signs transition from the maximum daytime luminance of 6,000 cd/m<sup>2</sup> to the maximum nighttime luminance of 300 cd/m<sup>2</sup>. This transition is completed no later than sunset to avoid potential high contrast, glare conditions. Similarly, the Signs transition from the night maximum luminance of 300 cd/m<sup>2</sup> to the day maximum luminance of 6,000 cd/m<sup>2</sup>, beginning no earlier than 45 minutes prior to sunrise. Therefore, the Signs would not exceed the CVC maximum of 500 fL, and therefore would not introduce a new source of glare during twilight.

The evaluation of the Sign luminance during the day (from sunrise until 45 minutes before sunset) compares the daytime, ambient brightness to the maximum sign brightness required by the CVC during full sun conditions and overcast sky conditions. The CVC, Section 21466.5, above, permits the Signs to "generate light intensity levels greater than 1,000 times the minimum measured brightness in the driver's field of view, except when the minimum values are less than 10 (fL)."

During the day (sunrise until 45 minutes before sunset), sunlight with clear sky conditions or light overcast conditions provides sufficient illuminance to generate surface brightness greater than 10 fL and up to 1200 fL on the least reflective surfaces, such as roadway pavement. Utilizing the value of 10 fL as the minimum within the driver's field of view, the maximum allowable brightness would be 1,000 times 10 fL, or 10,000 fL. The daytime maximum Sign luminance is 6,000 cd/m<sup>2</sup> (1,751 fL), which is less than 17.5% of the maximum luminance stipulated by the CVC. Therefore, the Signs will not create a new source of glare during day time hours of operation with clear sky or light overcast conditions.

Severe storms, heavy cloud cover, or other atmospheric conditions may occur during the day, which may cause the minimum brightness within the driver's field of view to be less than 10 fL. The Signs include an electronic control system to reduce the sign luminance from 6,000 cd/m<sup>2</sup> (1,751 fL) to 300 cd/m<sup>2</sup> (87.6 fL) maximum when the ambient sun light falls to illuminance values similar to night, less than 100 fc. During the day, when storms, cloud cover, or other low ambient sunlight conditions occur and when the ambient sunlight is less than 100 fc, the Signs will transition from the daytime 6,000 cd/m<sup>2</sup> (1,751 fL) to 300 cd/m<sup>2</sup> (87.6 fL) maximum, and thereby ensures that the sign brightness remains less than the maximum brightness required by the CVC. Therefore, the Signs would not create a new source of glare during day time periods with storm or severe overcast weather conditions and would not exceed 87.6 fL, or 17.5% of the 500 fL maximum allowed by the CVC during overcast conditions.

The Signs will not exceed 300 cd/m<sup>2</sup> (87.6 fL) luminance at night or during overcast sky conditions, and will not exceed 6,000 cd/m<sup>2</sup> (1,751 fL) during the day. The Sign luminance is less than the CVC standard, including 17.5% of the maximum allowable luminance permitted by the CVC for glare during the day. Therefore, the Signs will not create a new source of glare.

## I. CONCLUSIONS

This Study concludes the Project will not introduce a new source of light trespass at residential use properties or other sensitive use properties. All Sign locations (56 total) were surveyed to determine adjacent residential use properties or other sensitive use properties that may receive light trespass illuminance. Ten of the thirty-four Freeway Facing Sign locations and one of the twenty-two Non Freeway Facing Signs were evaluated at night from adjacent Monitoring Sites where there was a potential for visibility of the Signs from residential properties nearby (see Table 3 above). All Freeway Facing and Non Freeway Facing Signs were evaluated in comparison to a conservative maximum distance where light trespass from the Sign would be less than 0.30 fc or less than 10% of the maximum 3.0 fc permitted by the Los Angeles Municipal Code (LAMC). There are no residential use locations within 345 feet from Freeway Facing Sign FF-01. Therefore all residential use properties near FF-01 will receive less than 0.30 fc, or less than 10% of the maximum 3.0 fc permitted by LAMC. The majority of Freeway Facing Signs (26 of 34 locations, see Table 8, Appendix A and B) have no residential use locations within 300 feet from each Sign. For these 26 Sign locations where residential properties are more than 300 feet from the Freeway Facing Sign, the residential properties will receive less than 0.30 fc, or less than 10% of the maximum 3.0 fc permitted by LAMC. Eight Freeway Facing Signs are located less than 300 feet from residential use or hotel properties, and therefore were further evaluated to determine if the Signs are visible from the residential use, and if visible, the extent of light trespass illuminance. Freeway Facing Sign FF-21 is located 295 feet from the nearest residential and hotel use properties to the west of the Sign. Therefore, Sign FF-21 light trespass illuminance will be less than 0.30 fc at the residential and hotel property lines to the west of FF-21, and will therefore not create an impact. Freeway Facing Signs FF-13, FF-26, FF-28, FF-29, FF-30, FF-33, and FF-34 were evaluated to determine the calculated maximum light trespass illuminance at the nearest residential use property lines. For these seven Freeway Facing Signs the maximum light trespass illuminance is 0.6 fc at FF-29 and FF-30, 0.30 fc at FF-13, 0.20 fc at FF-26 and FF-28, and 0.10 fc at FF-33. The maximum light trespass illuminance at residential properties near to these seven Freeway Facing Signs is less than 20% of the maximum permitted by LAMC at FF-29, and less than 10% at the remaining 33 locations. Therefore, the Freeway Facing Signs will not create a light trespass impact at residential or sensitive use properties.

Similarly, the majority of the Non Freeway Facing Signs (19 of 22 locations) have no residential use properties within 175 feet from the Sign location. Residential use locations more than 270 feet from Non Freeway Facing Signs NFF-17 or NFF-18 will receive less than 0.30 fc, or less than 10% of the maximum 3.0 fc permitted by the LAMC. Residential use locations more than 175 feet from Non Freeway Facing Signs NFF-02 through NFF-16 or NFF-10 though NFF-20 will receive less than 0.30 fc, or less than 10% of the maximum 3.0 fc permitted by the LAMC. Non Freeway Facing Signs NFF-14, NFF-15, and NFF-20 were further analyzed with calculations to determine the maximum light trespass illuminance at the nearest residential use property line located less than 175 feet from the Signs. For these three Non Freeway Facing Signs the maximum light trespass illuminance is 2.50 fc at NFF-20, 0.10 fc at NFF-15, and 0.00 fc at NFF-14. The light trespass illuminance at all Non Freeway Facing Sign locations is less than the maximum permitted by LAMC. Therefore, the Non Freeway Facing Signs will not create a light trespass impact at residential or sensitive use properties.

Therefore, all Freeway Facing Signs and all Non Freeway Facing Signs will not create a substantial light trespass impact at any residential use property or any other sensitive use property.

Furthermore, the Project will not create a new source of glare. The Project potential to introduce a new source of glare is evaluated in this Study by comparison of the maximum night time sign luminance, which is set at 300 cd/m<sup>2</sup> in comparison to the existing luminance visible from the residential use properties where the Signs are visible. The existing luminance at adjacent residential use properties with a view to the Signs is documented at the Monitoring Sites as summarized in Table 6 above. The results of the comparison of the Sign maximum luminance to the existing measured luminance confirm the Signs will not introduce a source of high contrast or glare in comparison to the existing luminance at the residential use properties. The Project potential for glare is also evaluated with respect to the requirements of the California Vehicle Code, which regulates the maximum light source luminance which may affect the visibility of drivers on roadways. The maximum Project Sign luminance is substantially less than (82% less than) the maximum permitted by the California Vehicle Code during the night and during the day.

## **Metro TCN Lighting Study**

This Study confirms the light trespass from the Project is less than 3.0 fc at residential use properties or other sensitive use properties adjacent to the Project Sites, complies with the LAMC and will not create source of light trespass. Furthermore this Study confirms the Project will not create contrast ratios greater than 30 to 1, and will therefore not introduce a new source of glare at sensitive use properties. The Study also confirms the Project maximum luminance is less than the maximum luminance defined by the CVC for drivers, and therefore the Project will not introduce a new source of roadway glare. Since light intensity degrades exponentially with distance, residential properties or other sensitive use properties located farther from the Project Sites will receive substantially less light from the Signs. Therefore, there are no adverse lighting impacts resulting from the proposed Project.



**APPENDIX A. SIGN CONCEPT PLAN**

Freeway Facing TCN Structure Locations							
Sign ID	Map No.	Location	Assessor's Parcel Number	sf per Digital Display (No. of Digital Display Faces per TCN Structure)	Digital Display Height (ft)	Digital Display Width (ft)	Sign Height (from grade)
FF-01	3	US-101 North Lanes at Union Station	5409023941	1200 (1)	30	40	40
FF-02	3	US-101 South Lanes at Center Street	5173019901	672 (2)	14	48	72
FF-03	3	US-101 North Lanes at Keller Street	5409021902	672 (2)	14	48	72
FF-04	3	US-101 South Lanes at Beaudry Street	5160024904	672 (2)	14	48	75
FF-05	1	US-101 North Lanes, Northwest of Lankershim Boulevard	2423038970	672 (2)	14	48	65
FF-06	3	I-5 South Lanes at North Avenue 19	5415002903	672 (2)	14	48	85
FF-07	3	I-5 North Lanes at San Fernando Road	5445007903	672 (2)	14	48	85
FF-08	3	I-5 South Lanes and Exit Ramp to I-10	5410009901	672 (2)	14	48	85
FF-09	3	I-10 West Lanes (Bus Yard)	5410009901	672 (2)	14	48	50
FF-10	3	I-10 West Lanes and Entrance Ramp from I-5	5170010901	672 (2)	14	48	95
FF-11	3	I-10 East Lanes and Exit Ramp to SR-60 and I-5	5170010901	672 (2)	14	48	95
FF-12	3	I-10 West Lanes at Griffin Avenue and East 16th Street	5132029905	672 (2)	14	48	80
FF-13	1	SR-2 South Lanes Northeast of Casitas Avenue	5436033906	672 (2)	14	48	85
FF-14	1	SR-2 North Lanes Northeast of Casitas Avenue	5442001900	672 (2)	14	48	85
FF-15	1	SR-170 South Lanes at Raymer Street	2324002901	672 (1)	14	48	40
FF-16	1	SR-170 North Lanes North of Sherman Way	2307021901	672 (1)	14	48	40
FF-17	1	I-5 North Lanes South of Tuxford Street	2408038900	672 (2)	14	48	85
FF-18	1	I-5 South Lanes South of Tuxford Street	2632001901	672 (2)	14	48	85
FF-19	1	SR-118 East of San Fernando Road	2523001900	672 (2)	14	48	80

**Metro TCN Lighting Study**

Freeway Facing TCN Structure Locations							
Sign ID	Map No.	Location	Assessor's Parcel Number	sf per Digital Display (No. of Digital Display Faces per TCN Structure)	Digital Display Height (ft)	Digital Display Width (ft)	Sign Height (from grade)
FF-20	1	SR-118 East of San Fernando Road	2523001900	672 (2)	14	48	80
FF-21	2	I-110 South Lanes at Exposition Boulevard	5037030902	672 (2)	14	48	80
FF-22	1	I-5 North Lanes at San Fernando Road	2603001901	672 (2)	14	48	65
FF-23	2	I-110 North Lanes at Exposition Boulevard	5122024909	672 (2)	14	48	80
FF-24	1	I-5 South Lanes at San Fernando Road and Sepulveda Boulevard	2605001915	672 (2)	14	48	95
FF-25	1	I-405 South Lanes at Victory Boulevard	2251002905	672 (2)	14	48	80
FF-26	2	I-405 North Lanes at Exposition Boulevard	4256010902	672 (2)	14	48	95
FF-27	2	I-405 South Lanes at Exposition Boulevard	4260039906	672 (1)	14	48	95
FF-28	2	I-10 West at Robertson Boulevard	4313024906	672 (1)	14	48	80
FF-29	2	SR-90 East at Culver Boulevard	4211007907	672 (2)	14	48	80
FF-30	2	SR-90 West at Culver Boulevard	4223009906	672 (2)	14	48	80
FF-31	2	I-105 West Lanes at Aviation Boulevard	4129028901	672 (2)	14	48	95
FF-32	2	I-105 East Lanes at Aviation Boulevard	4138001902	672 (2)	14	48	95
FF-33	2	I-110 South Lanes at Slauson Avenue	5001037907	672 (1)	14	48	80
FF-34	2	I-110 North Lanes at Slauson Avenue	5101040900	672 (2)	14	48	80



Non-Freeway Facing TCN Structure Locations							
Sign ID	Map No.	Location	Assessor Parcel Number	sf per Digital Display (No. of Digital Display Faces per TCN Structure)	Digital Display Height (ft)	Digital Display Width (ft)	Sign Height (from grade)
NFF-1	1	Northeast corner of Vermont Avenue and Sunset Boulevard	5542015900	300 (2)	10	30	30
NFF-2	3	Spring Street Bridge, 326 feet North of Aurora Street	5409002900	300 (2)	10	30	65
NFF-3	1	Northwest corner of Lankershim Boulevard and Chandler Boulevard	2350016906	300 (1)	10	30	30
NFF-4	1	Northwest corner of Lankershim Boulevard and Universal Hollywood Drive	2423036919	300 (1)	10	30	30
NFF-5	1	Southwest corner of Lankershim Boulevard and Universal Hollywood Drive	2423036919	300 (1)	10	30	30
NFF-6	3	Southwest corner of 4th Street and Hill Street	5149015902	300 (1)	10	30	30
NFF-7	2	Venice Boulevard, 240 feet West of Robertson Boulevard	4313024909	300 (1)	10	30	30
NFF-8	3	Southeast corner of Alameda Street and Commercial Street	5173001901	672 (2)	14	48	60
NFF-9	1	Northeast corner of Van Nuys Boulevard and Orange Line Busline	2240008905	300 (2)	10	30	30
NFF-10	1	Southeast corner of Sepulveda Boulevard and Erwin Street	2242001904	300 (1)	10	30	30
NFF-11	2	Southwest of Crenshaw Boulevard, 175 feet South of 67th Street	4006025900	300 (1)	10	30	30
NFF-12	2	Southeast corner of Crenshaw Boulevard and Exposition Boulevard	5044002900	300 (2)	10	30	30
NFF-13	3	Southeast corner of East Cesar Chavez Avenue and North Vignes Street	5409023941	300 (2)	10	30	30
NFF-14	2	Pico Boulevard and Exposition Boulevard, South of rail	4260025902	300 (1)	10	30	30
NFF-15	2	Pico Boulevard, 445 feet West of Sawtelle Boulevard	4260039906	300 (1)	10	30	30



**Metro TCN Lighting Study**

Non-Freeway Facing TCN Structure Locations							
Sign ID	Map No.	Location	Assessor Parcel Number	sf per Digital Display (No. of Digital Display Faces per TCN Structure)	Digital Display Height (ft)	Digital Display Width (ft)	Sign Height (from grade)
NFF-16	3	Southeast corner of South Central Avenue and East 1st Street	5161018903	300 (2)	10	30	30
NFF-17	2	Century Boulevard, 152 feet West of Aviation Boulevard	4125026904	672 (2)	14	48	80
NFF-18	2	Southwest Aviation Boulevard and South of Arbor Vitae Street	4125020907	672 (2)	14	48	30
NFF-19	2	Northwest corner of Vermont Avenue and Beverly Boulevard	5520019900	300 (2)	10	30	30
NFF-20	2	Southwest corner of Santa Monica Boulevard and Vermont Avenue	5538022903	300 (2)	10	30	30
NFF-21	3	South of 4th Street 210 feet East of South Santa Fe Avenue	5163017900	300 (2)	10	30	65
NFF-22	3	Northwest corner of East 7th Street and South Alameda Street	5147035904	300 (2)	10	30	30

**APPENDIX B. SIGN LOCATION PLANS**



The Bradbury Building  
304 South Broadway, Suite 300  
Los Angeles, CA 90013

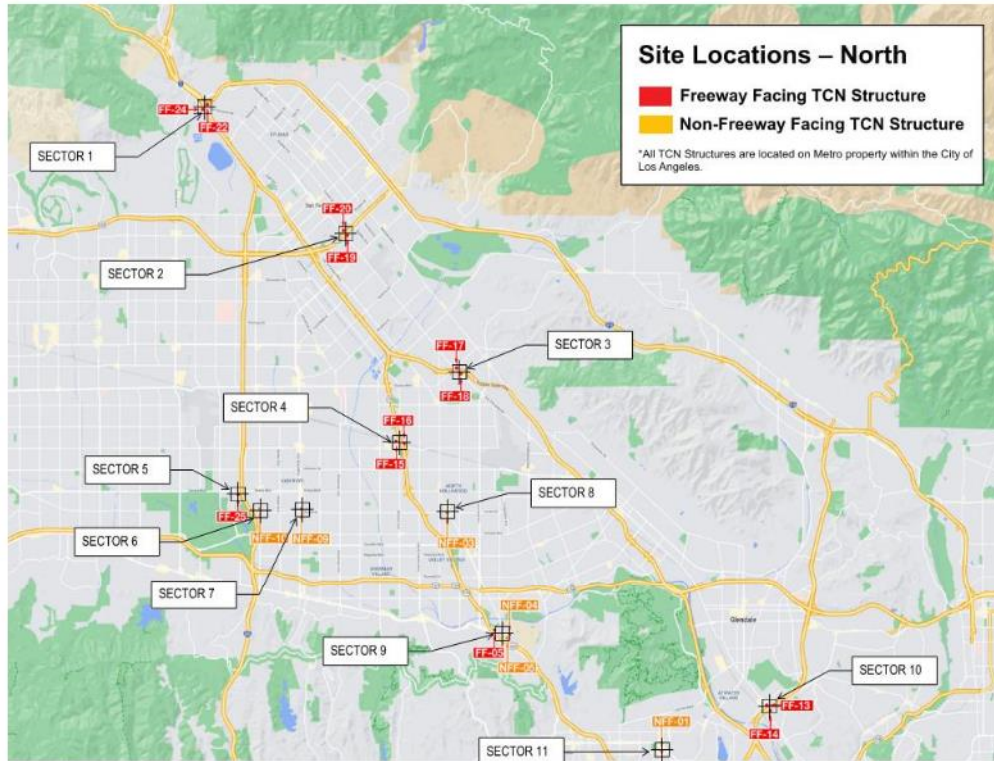
+1 213 617 0477  
fkaid.com

Francis Krahe & Associates

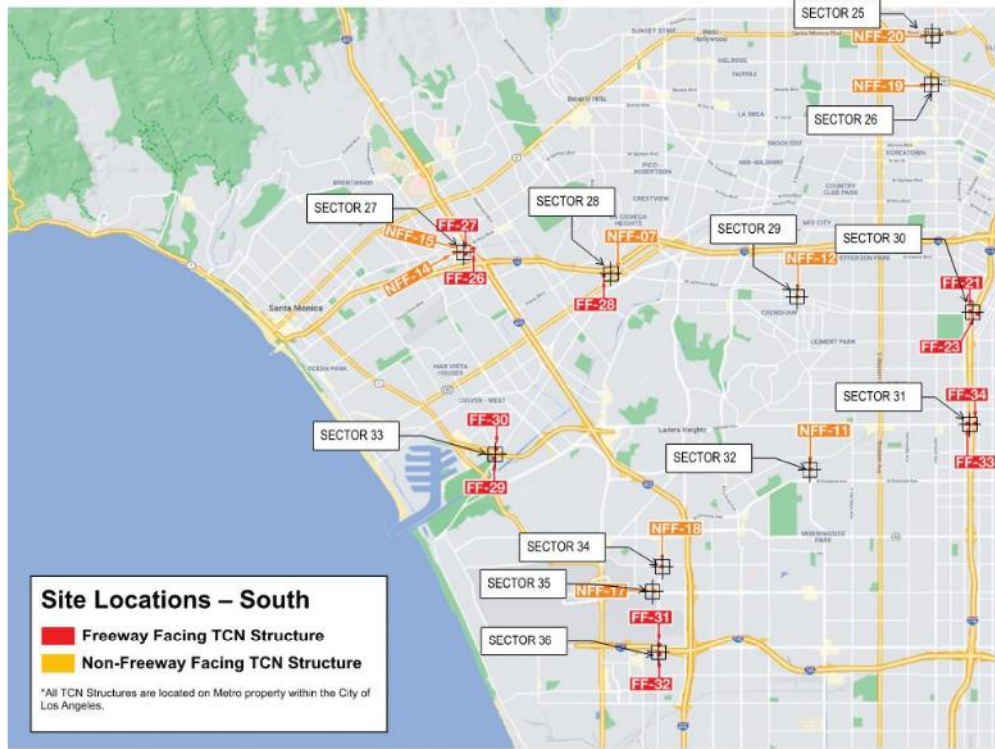
# Appendix B

Sign Location Plans

Metro TCN Lighting Study



Sector Key Map 1 - North



Sector Key Map 2 - South

**Metro TCN Lighting Study**



*Sector Key Map 3 - Downtown*



Sector 1



Sector 2



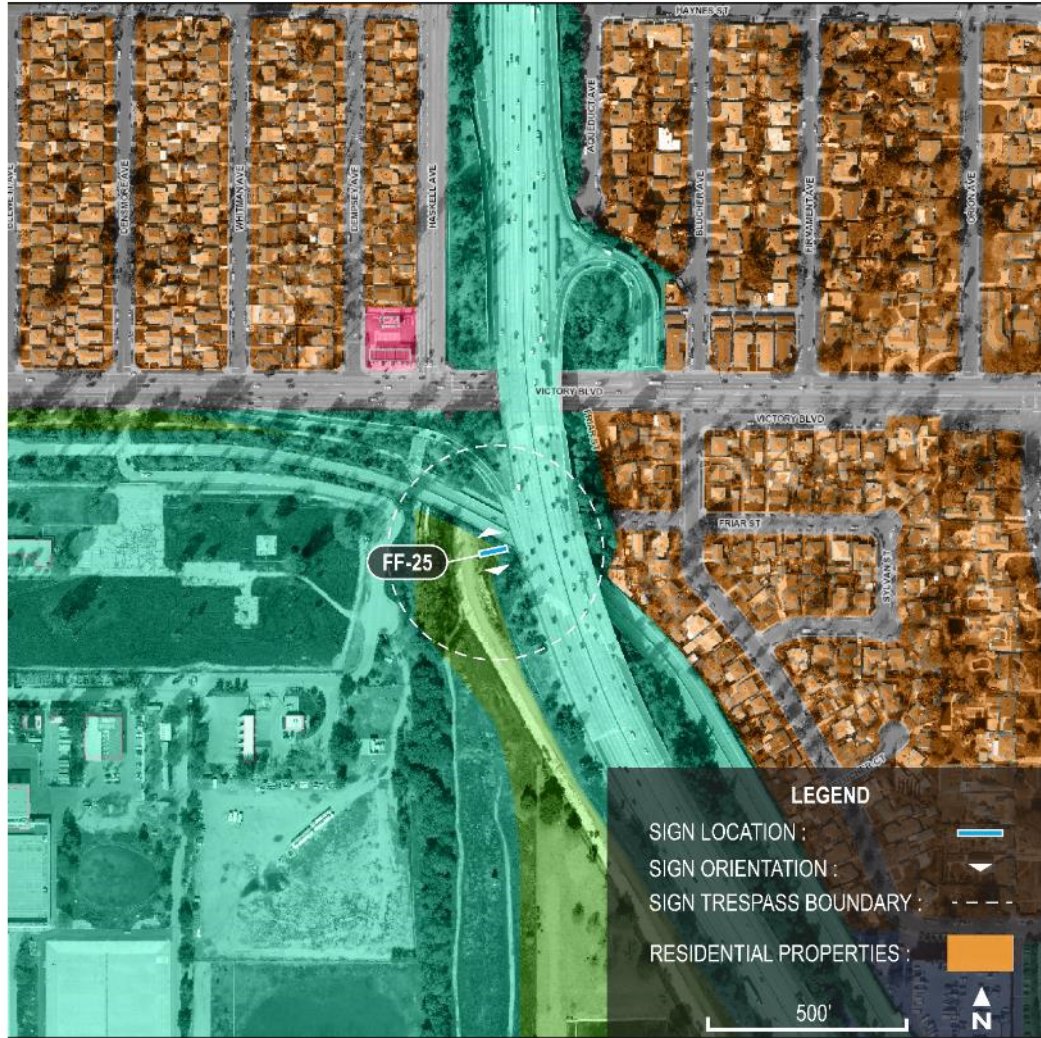
Sector 3



Metro TCN Lighting Study

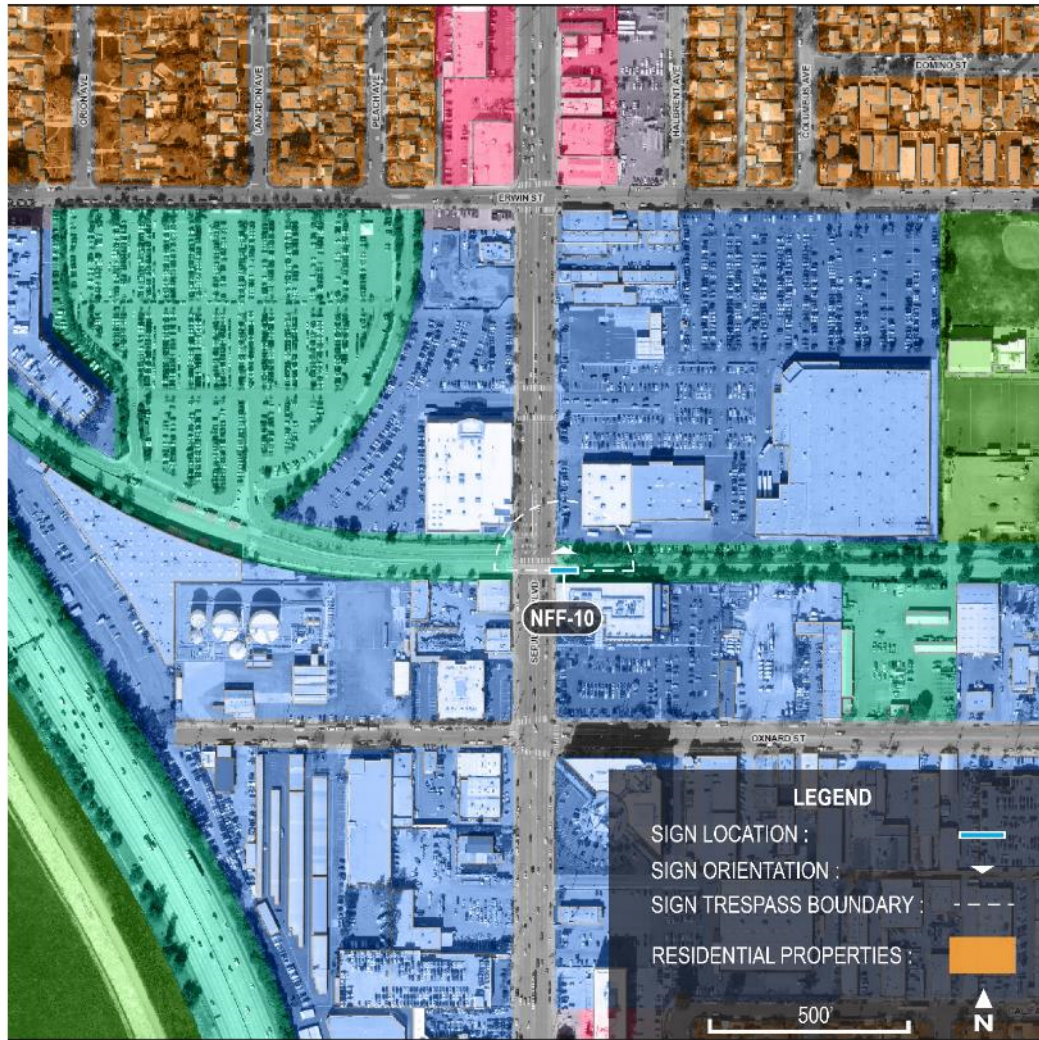


Sector 4



Sector 5

Metro TCN Lighting Study

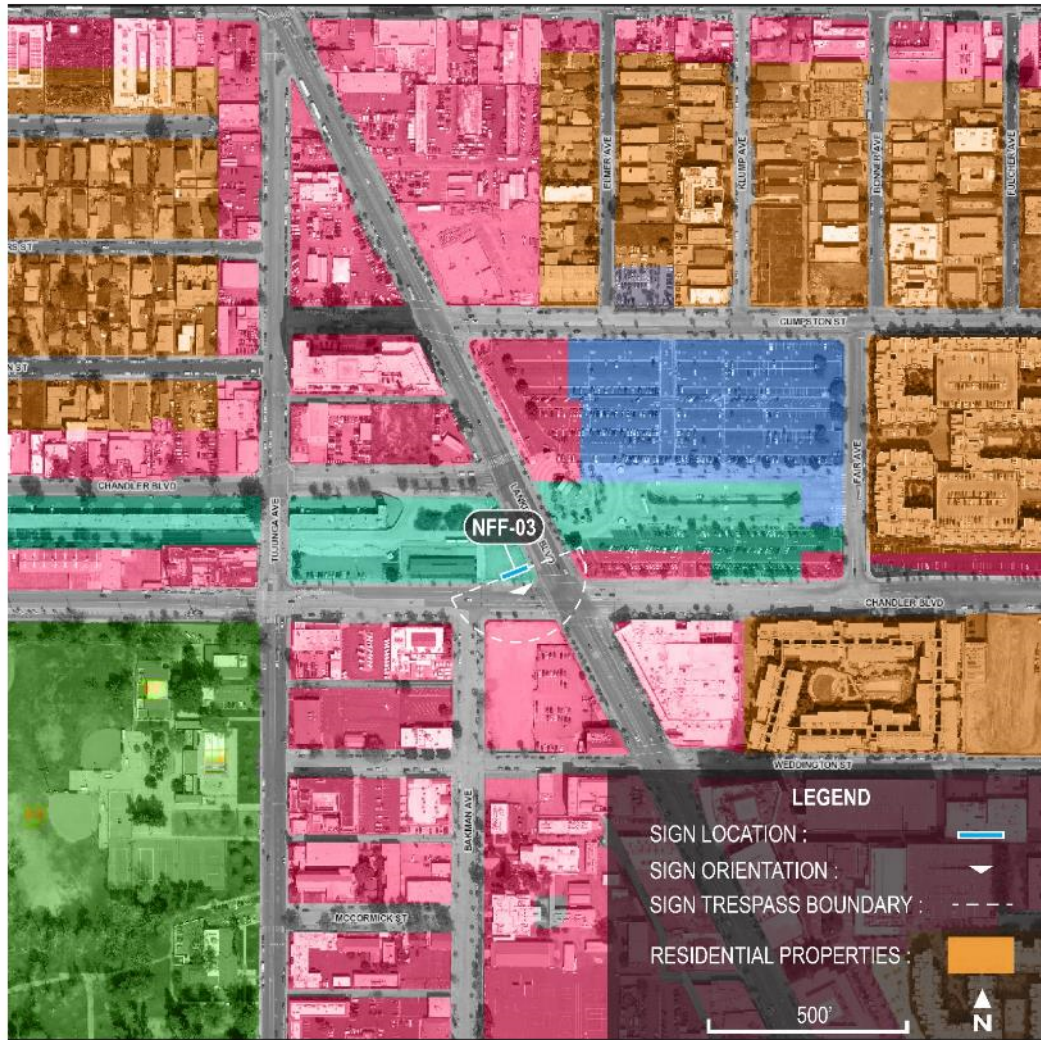


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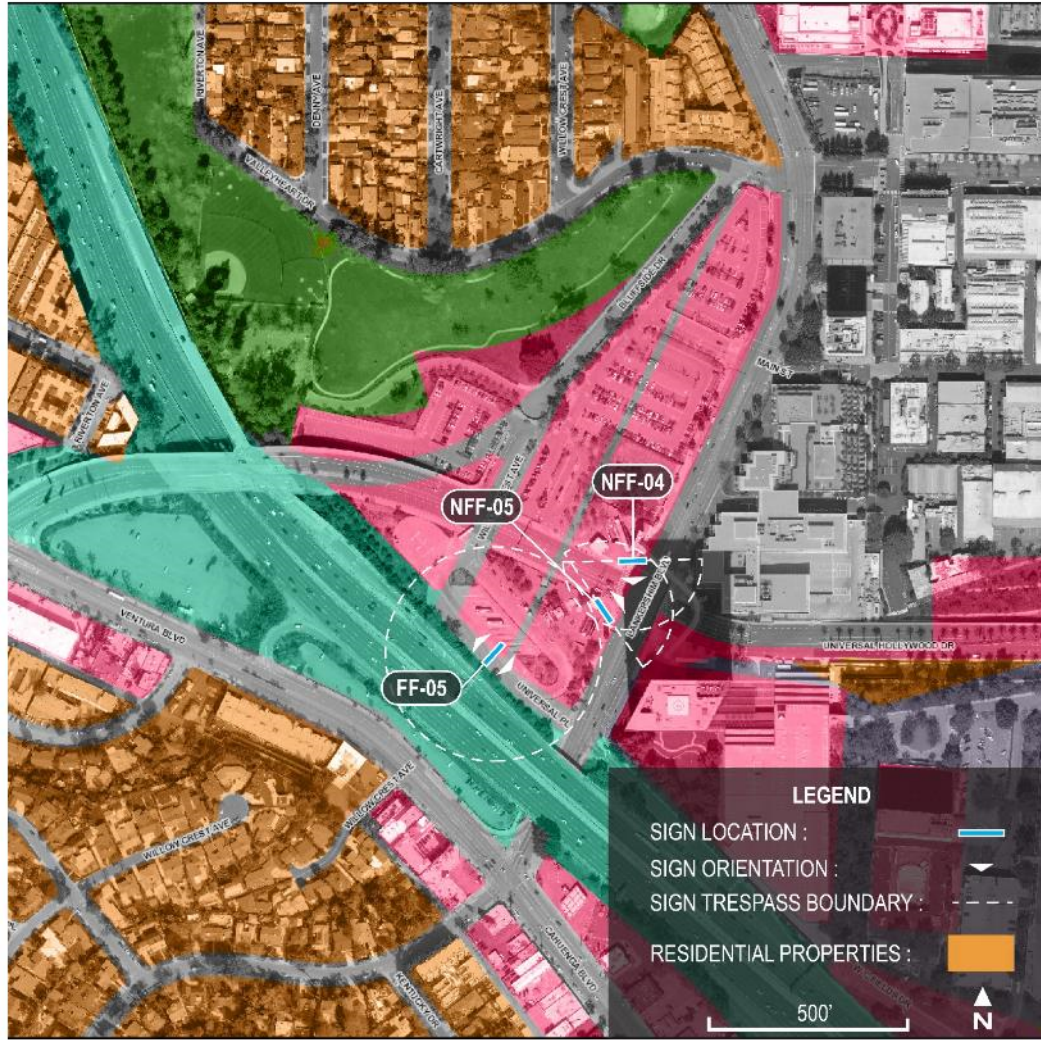


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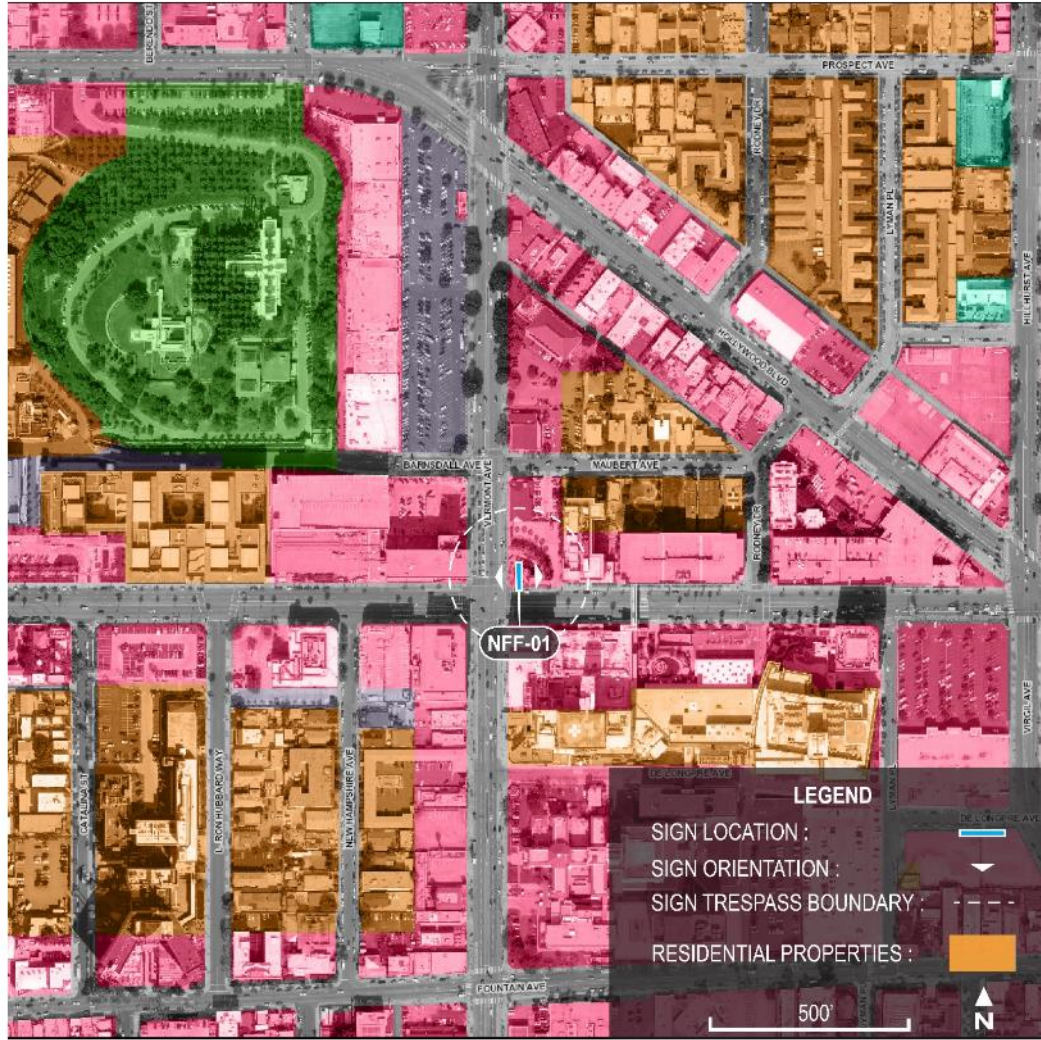
Sector 8



Sector 9

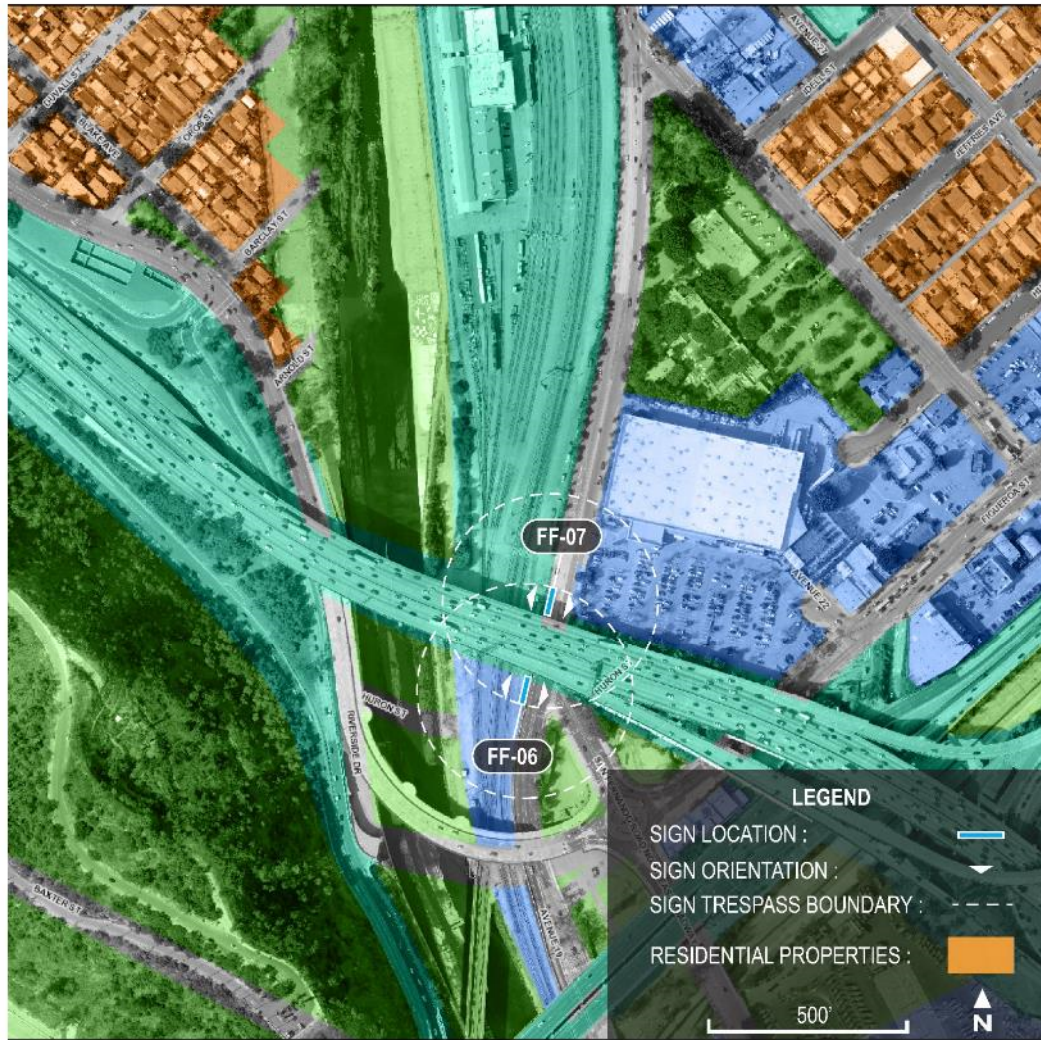


Sector 10



Sector 11





Sector 12



Sector 13

Metro TCN Lighting Study



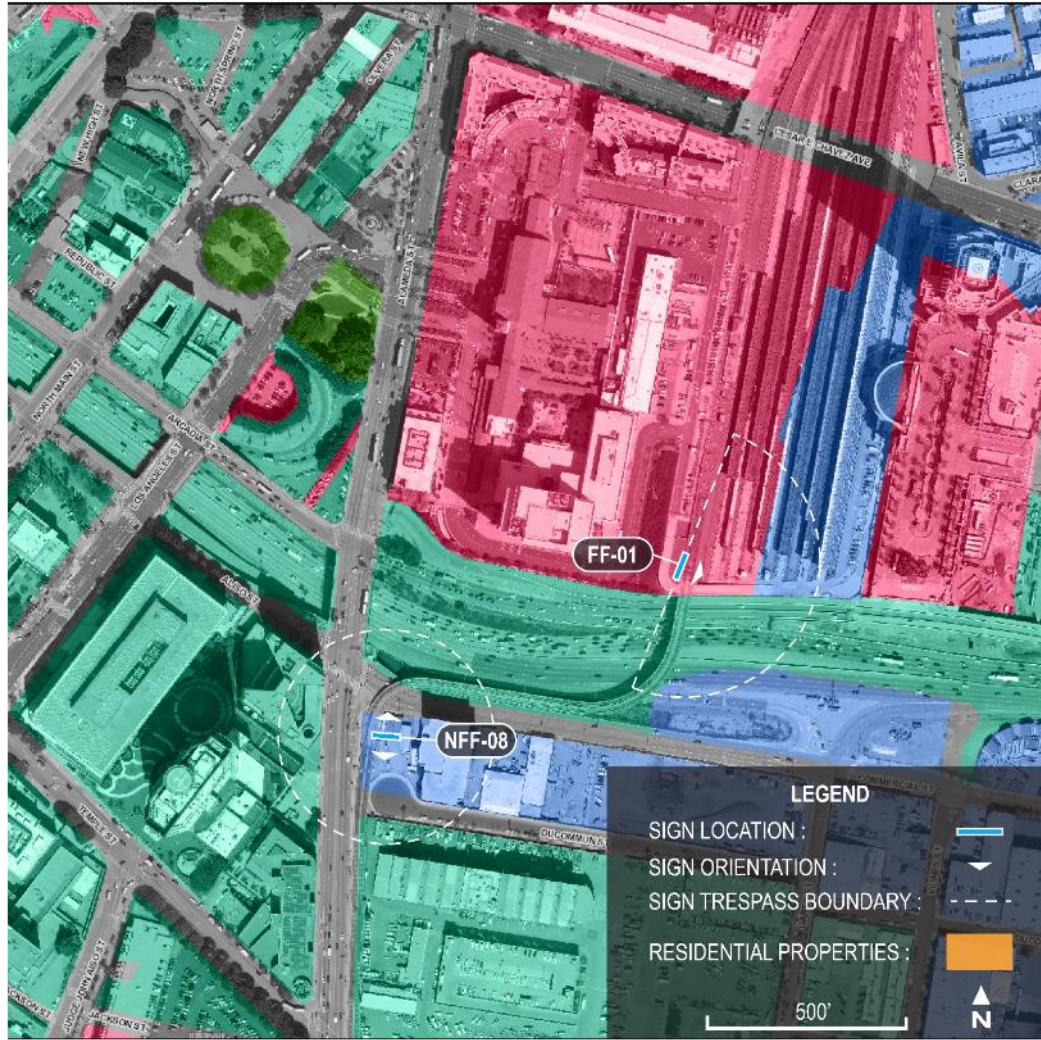
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Sector 15



Sector 16

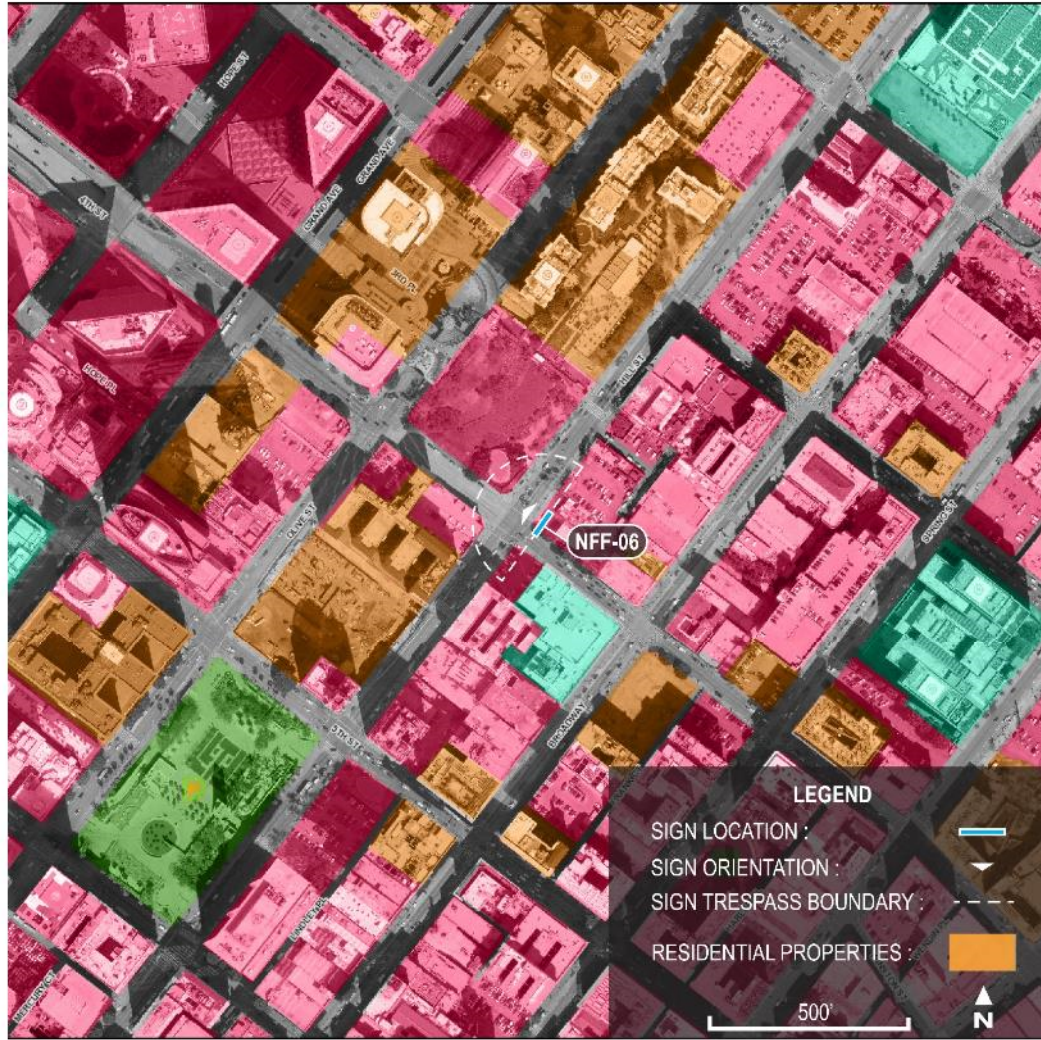


Sector 17

Metro TCN Lighting Study



Sector 18



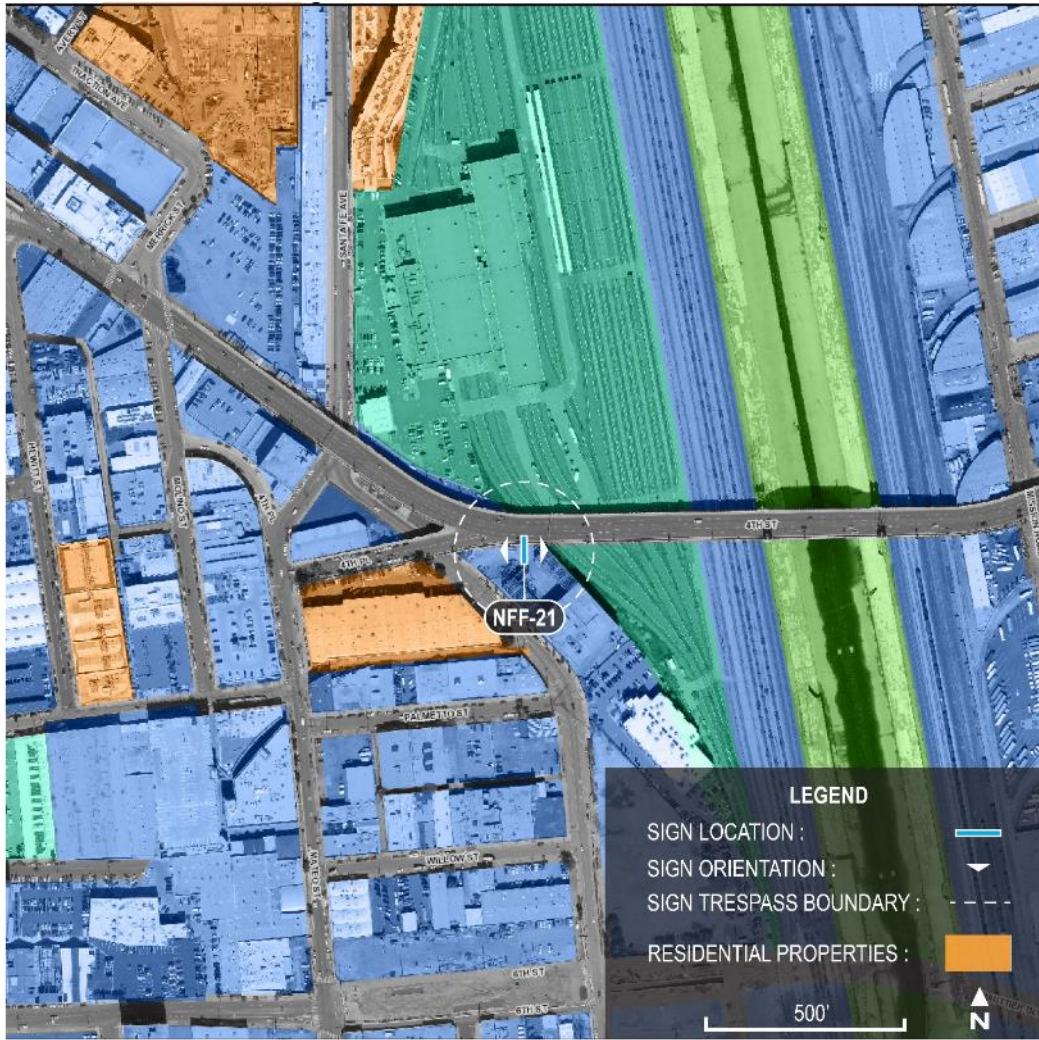
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Metro TCN Lighting Study



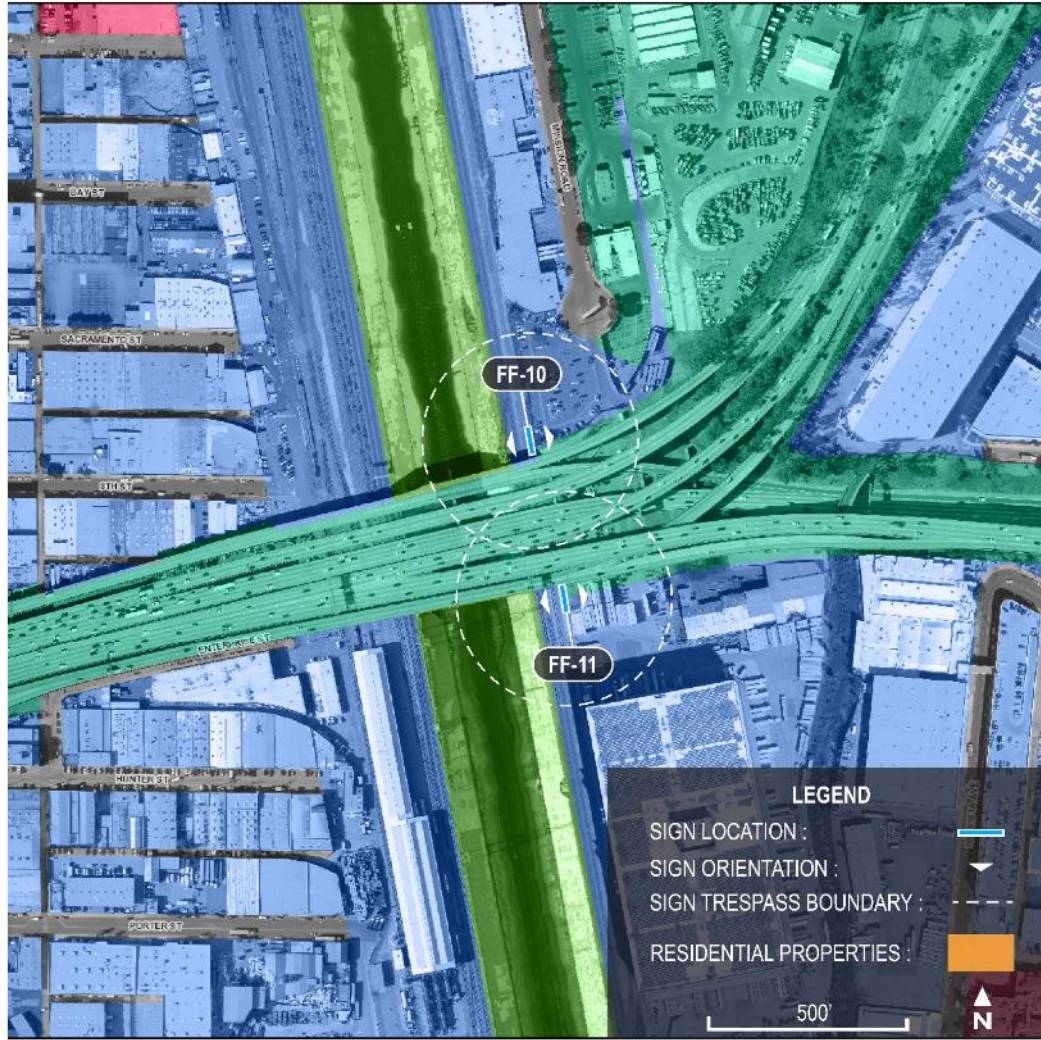
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Sector 21



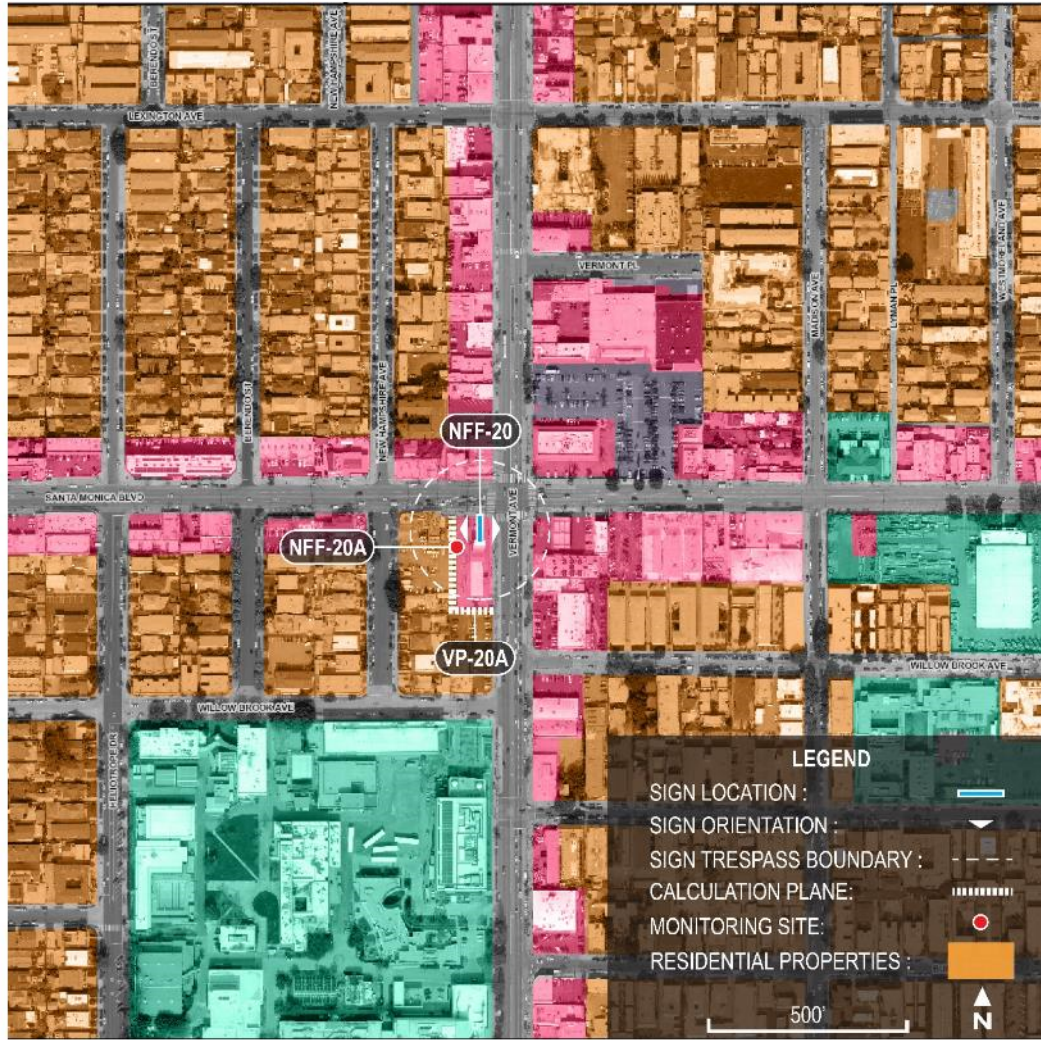
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Sector 23

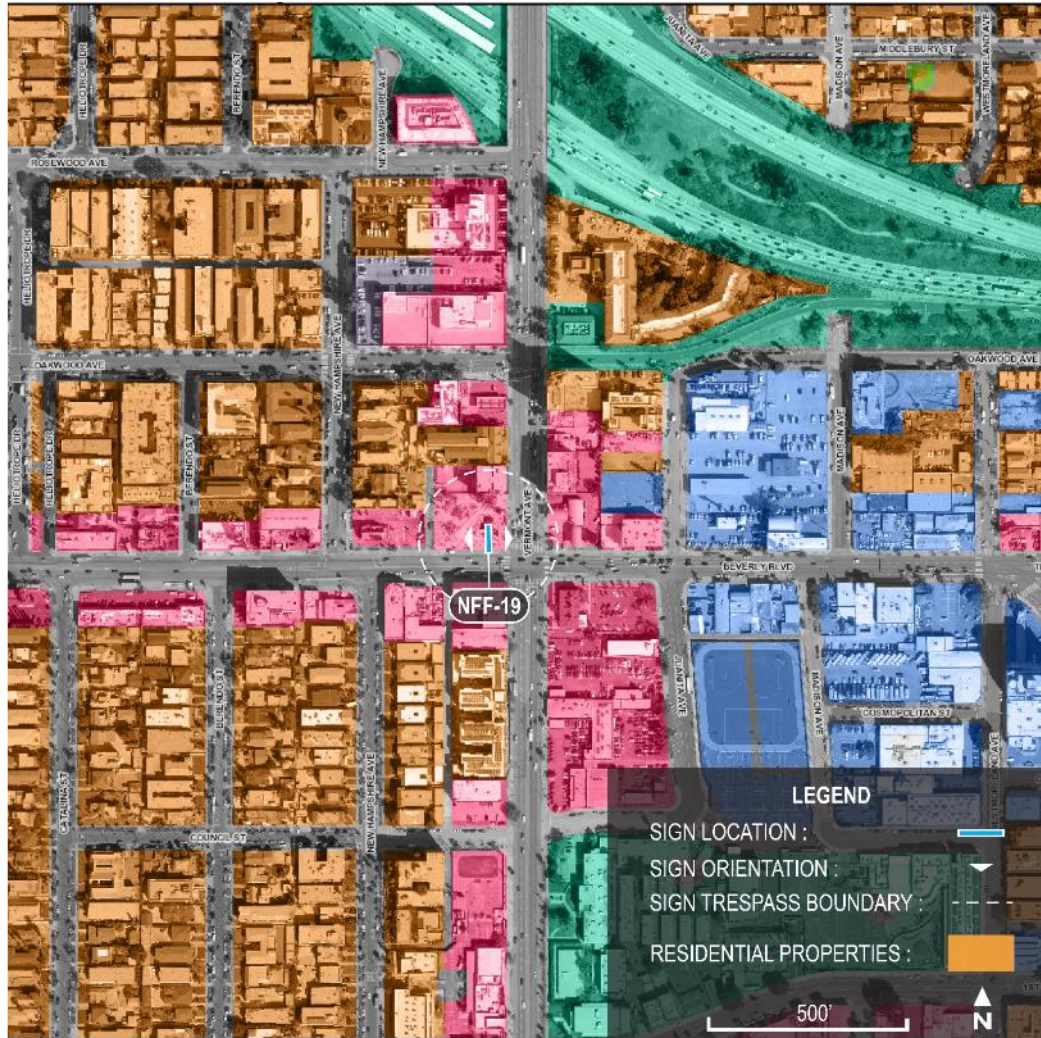


Sector 24



Sector 25

Metro TCN Lighting Study



Sector 26



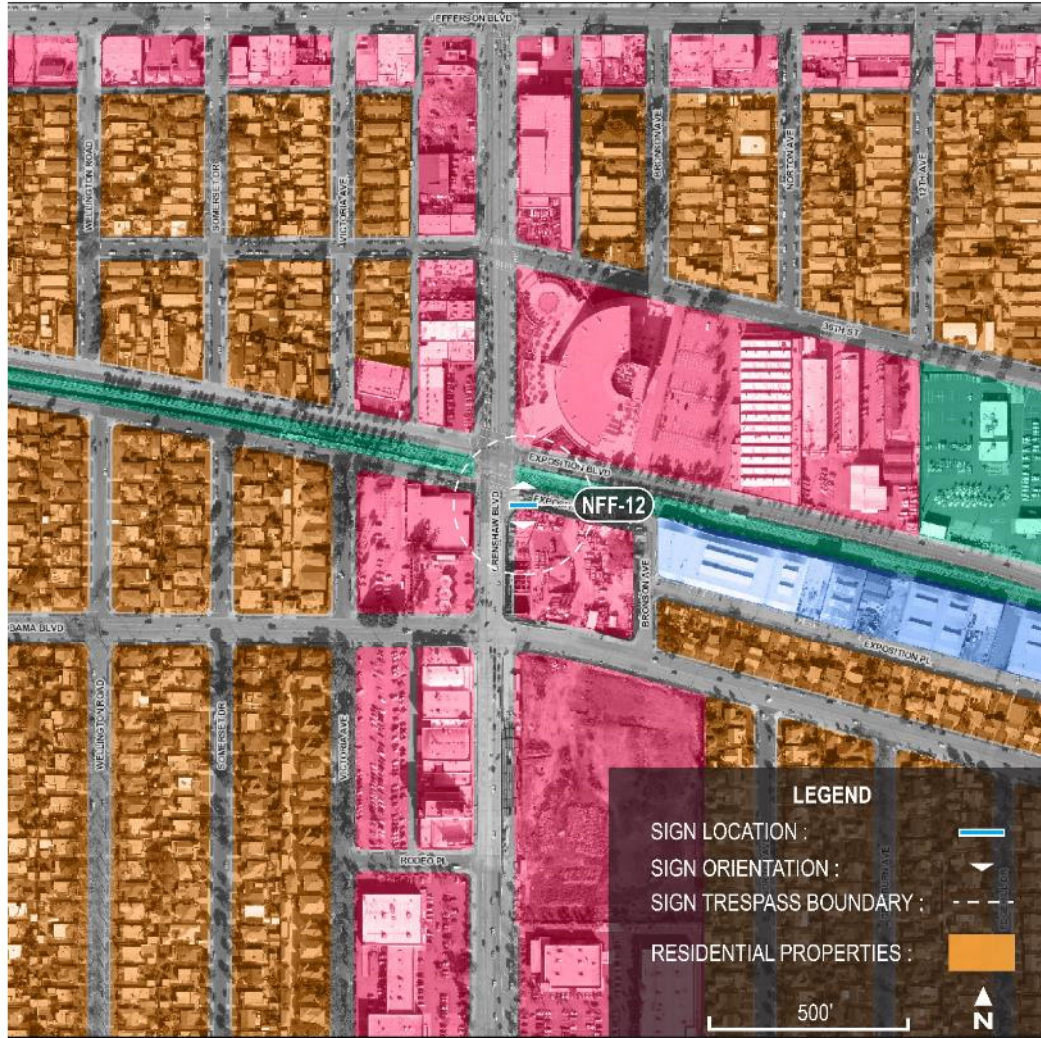
Sector 27



Metro TCN Lighting Study



Sector 28

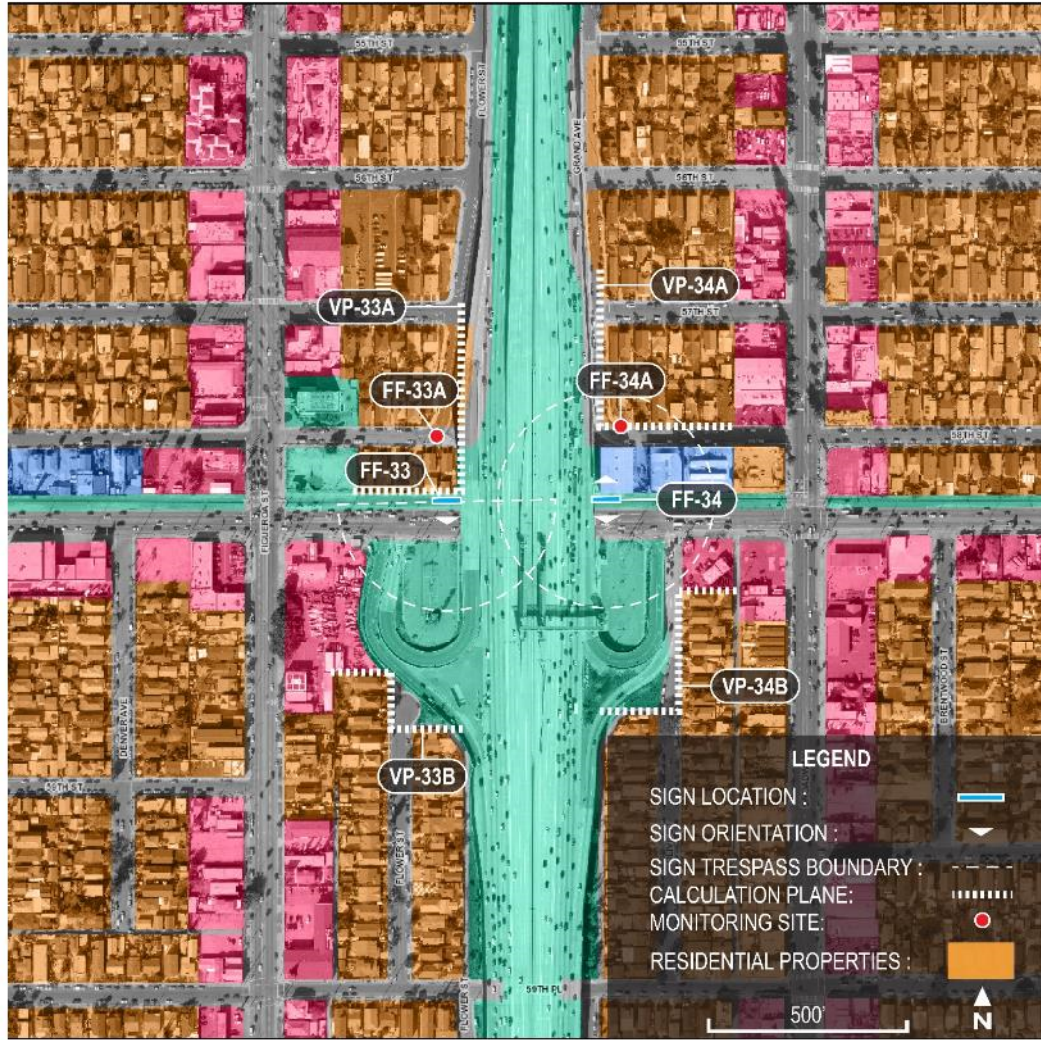


Sector 29

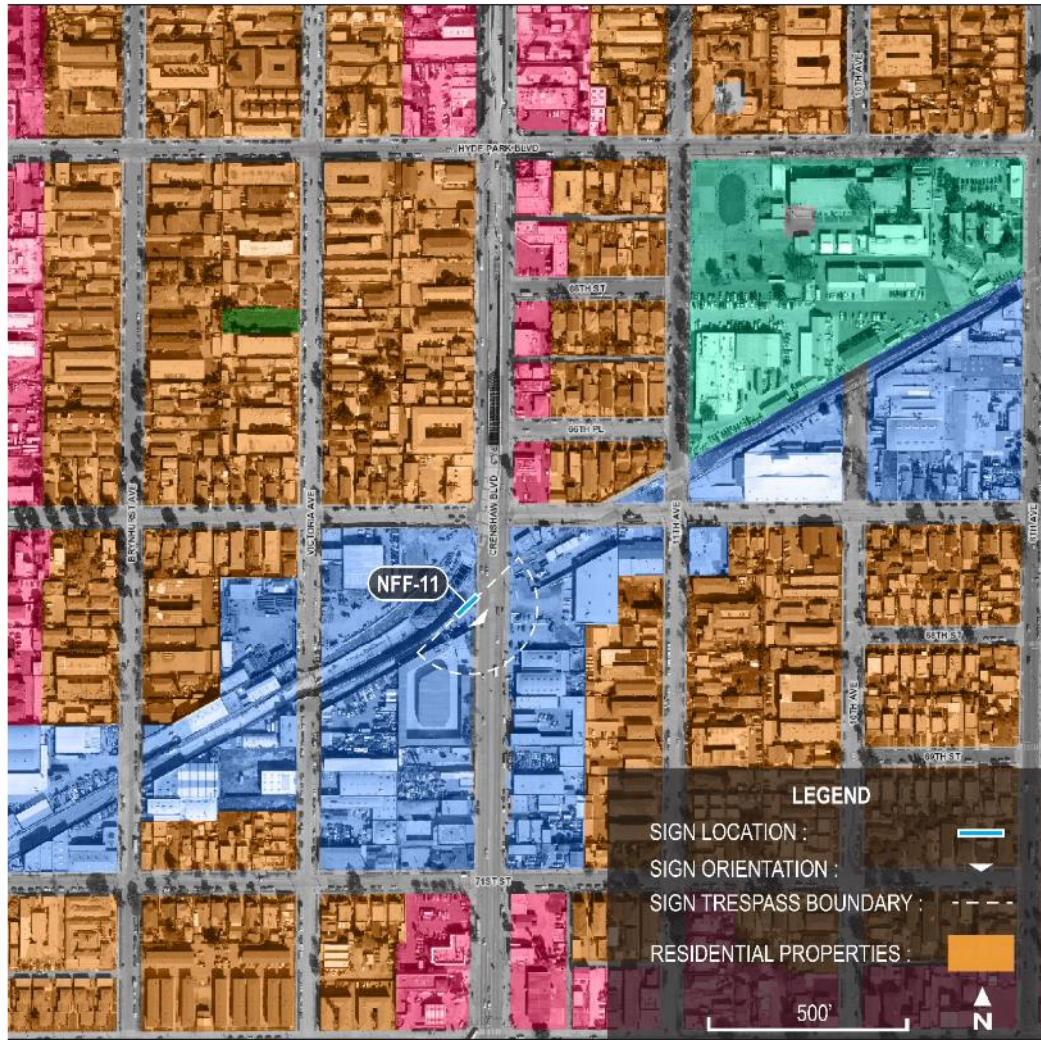
Metro TCN Lighting Study



Sector 30



Sector 31



Sector 32



Sector 33

Metro TCN Lighting Study



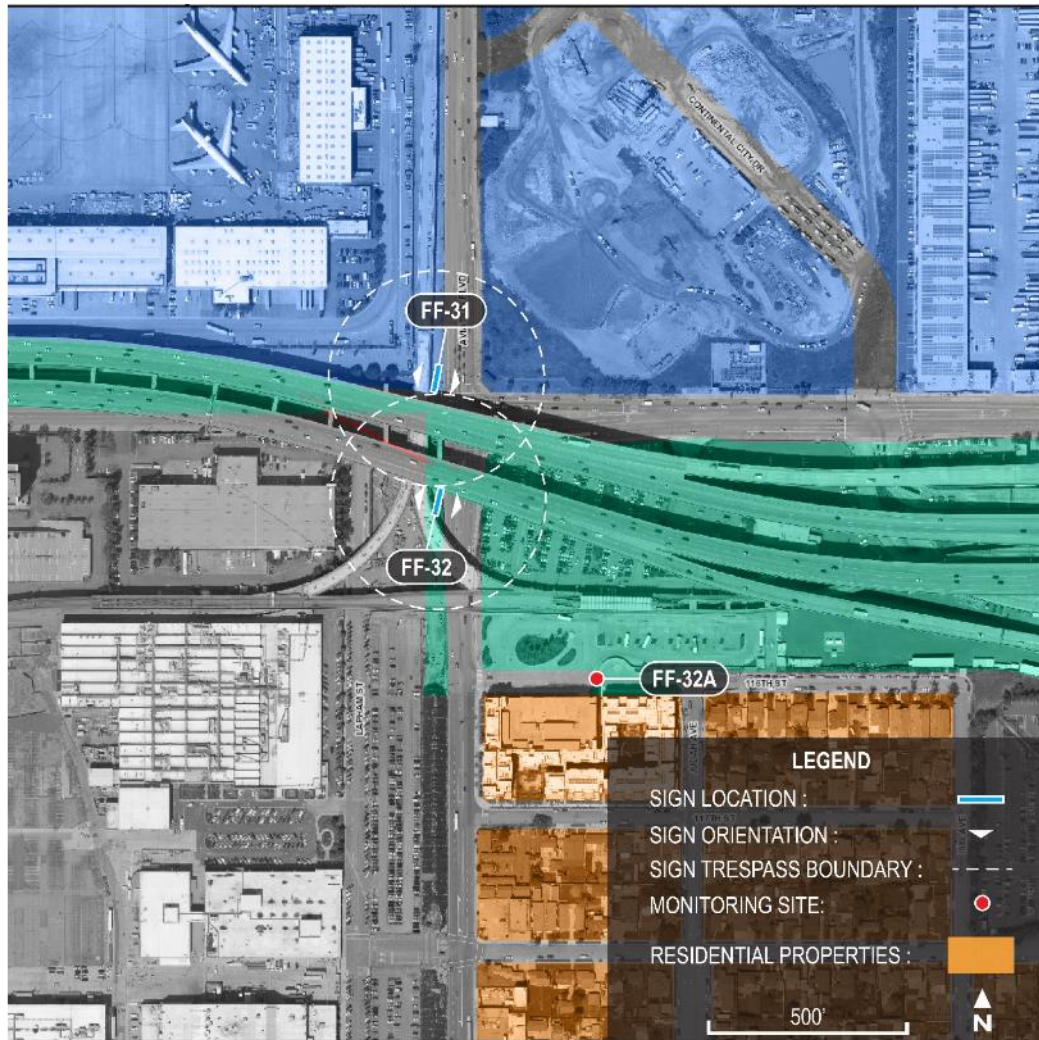
Sector 34



Sector 35



Metro TCN Lighting Study



Sector 36



## APPENDIX C. IESNA LP-11-20

ANSI/IES LP-11-20

### 4.1 Lighting Zone Definitions

Because identifying the appropriate outdoor lighting zone is a matter of judgment and consensus, there is no absolute means of determining which lighting zone designation is appropriate for a given area. The same type of lighting application may fall into different lighting zones in different jurisdictions or using different standards. As used in the *Joint IDA-IES Model Lighting Ordinance (MLO)*,<sup>9</sup> the lighting zones are defined with suggested uses:

- **LZ-0: No ambient light**

LZ-0 (see **Figure 4-1**) includes areas where the natural environment could be seriously and adversely affected by small amounts of electric lighting at night. This includes biological cycles of flora and fauna, and human enjoyment and appreciation of the natural environment. The vision of human residents and users of these areas is adapted to the total darkness, and they do not expect to see electric lighting. Human activity is sparse and is subordinate in importance to the natural environment. There is no expectation for electric lighting. Although some lighting is allowed, it is required to be controlled.

<p><b>LZ-0</b></p> <p>Lighting Zone 0 should be applied to areas in which permanent lighting is not expected and when used, is limited in the amount of lighting and the period of operation. LZ-0 typically includes undeveloped areas of open space, wilderness parks and preserves, areas near astronomical observatories, or any other area where the protection of a dark environment is critical. Special review should be required for any permanent lighting in this zone. Some rural communities may choose to adopt LZ-0 for residential areas.</p>	<p>Recommended default zone for wilderness areas, parks and preserves, and undeveloped rural areas.</p> <p>Includes protected wildlife areas and corridors.</p>
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**Figure 4-1. LZ-0 description from the MLO.**

- **LZ-1: Low ambient light**

LZ-1 (see **Figure 4-2**) includes developed areas within a natural environment and areas of human activity that are inherently dark at night. Electric lighting at night could adversely affect the biological cycles of flora and fauna, or could interrupt the quiet, dark character of the area. The vision of human residents and users of these areas is adapted to the low light levels, and they do not expect to see electric lighting except where absolutely necessary to improve visibility and safety. In these limited areas, low light levels

are appropriate. Lighting is expected to be non-continuous (i.e., pools of light rather than uniform lighting along a path or roadway). After curfew, both light levels and uniformity may be reduced in some areas. An example of a parking lot in an LZ-1 area is shown in **Figure 4-3**.

<p><b>LZ-1</b></p>	<p>Lighting Zone 1 pertains to areas that desire low ambient lighting levels. These typically include single and two family residential communities, rural town centers, business parks, and other commercial or industrial/storage areas typically with limited nighttime activity. May also include the developed areas in parks and other natural settings.</p>	<p>Recommended default zone for rural and low density residential areas.</p> <p>Includes residential single or two family; agricultural zone districts; rural residential zone districts; business parks; open space include preserves in developed areas.</p>
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**Figure 4-2. LZ-1 description from the MLO.**



**Figure 4-3. A parking lot located in a Lighting Zone 1 community.** (Image courtesy of Bob Parks)

- **LZ-2: Moderate ambient light**

LZ-2 (see **Figure 4-4**) includes areas human activity (i.e., habitation, recreation, and/or work) where electric lighting may be required for increased mobility and convenience at night. The vision of human residents and users of these areas is adapted to moderate light levels, and they have moderate expectations of electric lighting. Lighting is expected to be non-continuous (e.g., pools of light at crosswalks or intersections, rather than uniform lighting along a path or street). After curfew, both light levels and uniformity may be reduced in some areas as activity levels decline. **Figure 4-5** shows an example of a street located in an LZ-2 area.

# Metro TCN Lighting Study

## Lighting Practice: Environmental Considerations for Outdoor Lighting

<b>LZ-2</b>	Lighting Zone 2 pertains to areas with moderate ambient lighting levels. These typically include multifamily residential uses, institutional residential uses, schools, churches, hospitals, hotels/motels, commercial and/or businesses areas with evening activities embedded in predominately residential areas, neighborhood serving recreational and playing fields and/or mixed use development with a predominance of residential uses. Can be used to accommodate a district of outdoor sales or industry in an area otherwise zoned LZ-1.	Recommended default zone for light commercial business districts and high density or mixed use residential districts.  Includes neighborhood business districts; churches, schools and neighborhood recreation facilities; and light industrial zoning with modest nighttime uses or lighting requirements.
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Figure 4-4. LZ-2 description from the MLO.



Figure 4-5. A street located in an LZ-2 area: fully shielded lighting, uniform distribution. (Image courtesy of Bob Parks)

- **LZ-3: Moderately high ambient light**

LZ-3 (see **Figure 4-6**) includes areas of human activity (i.e., habitation, recreation, and/or work) where electric lighting may be continuous and is required for and convenience at night. The vision of human residents and users of these areas is adapted to moderately high light levels, and they have moderate to high expectations of electric lighting. Lighting is expected to be continuous (e.g. lighting delivered fairly evenly along the length of a path or street). After curfew, both light levels and uniformity may be reduced in some areas as activity levels decline. **Figure 4-7** shows an example of building façade lighting in an LZ-3 area.

<b>LZ-3</b>	Lighting Zone 3 pertains to areas with moderately high lighting levels. These typically include commercial corridors, high intensity suburban commercial areas, town centers, mixed use areas, industrial uses and shipping and rail yards with high night time activity, high use recreational and playing fields, regional shopping malls, car dealerships, gas stations, and other nighttime active exterior retail areas.	Recommended default zone for large cities' business district.  Includes business zone districts; commercial mixed use; and heavy industrial and/or manufacturing zone districts.
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Figure 4-6. LZ-3 description from the MLO.



Figure 4-7. A long-term care facility in an LZ-3 area: well-shielded lighting—no direct uplight. (Image courtesy of David Roederer)

- **LZ-4: High ambient light**

LZ-4 (see **Figure 4-8**) includes areas of high levels of human activity at night, including significant interaction among pedestrians and/or vehicles. The vision of humans when outside is typically adapted to moderate light levels. Lighting is continuous and is required for safety and convenience. Expectations for electric lighting are high, both in terms of light levels and uniformity along pathways or streets. However, both light levels and uniformity may be reduced after curfew hours in some areas as activity levels decline. **Figure 4-9** shows an example of an urban entertainment area designated as LZ-4.

<b>LZ-4</b>	Lighting zone 4 pertains to areas of very high ambient lighting levels. LZ-4 should only be used for special cases and is not appropriate for most cities. LZ-4 may be used for extremely unusual installations such as high density entertainment districts, and heavy industrial uses.	Not a default zone.  Includes high intensity business or industrial zone districts.
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Figure 4-8. LZ-4 description from the MLO.



Figure 4-9. Example of an entertainment district in an LZ-4 urban area. (Image courtesy of Bob Parks)



APPENDIX D. IESNA TABLE 26.5

**Table 26.5 | Recommended Light Trespass Illuminance Limits**

Lighting Zone	Limit in lux <sup>a</sup>	
	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]

**Metro TCN Lighting Study**
**APPENDIX E. LIGHT TRESPASS CALCULATION DATA**

**VP-13A**

		Distance (ft)														
		5	15	25	35	45	55	65	75	85	95	105	115	125	135	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		145	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		125	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		115	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		105	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		95	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		85	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		75	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		65	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		55	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		45	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
35	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
25	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

**VP-13A**

		Distance (ft)																
		145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		145	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.20	0.20
		135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.20	0.20
		125	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.20
		115	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.20
		105	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30
		95	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30
		85	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30
		75	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30
		65	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.20
		55	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30
		45	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30
35	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.20		
25	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.20		
15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.30	0.30	0.20		
5	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20		



**Metro TCN Lighting Study**
**VP-13A**

		Distance (ft)		
		625	635	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00
		185	0.00	0.00
		175	0.00	0.00
		165	0.00	0.00
		155	0.00	0.00
		145	0.00	0.00
		135	0.00	0.00
		125	0.00	0.00
		115	0.00	0.00
		105	0.00	0.00
		95	0.00	0.00
		85	0.00	0.00
		75	0.00	0.00
		65	0.00	0.00
		55	0.00	0.00
		45	0.00	0.00
		35	0.00	0.00
25	0.00	0.00		
15	0.00	0.00		
5	0.00	0.00		

**VP-14A**

		Distance (ft)														
		5	15	25	35	45	55	65	75	85	95	105	115	125	135	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		









VP-14A

		Distance (ft)																
		785	795	805	815	825	835	845	855	865	875	885	895	905	915	925	935	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

VP-14A

		Distance (ft)				
		945	955	965	975	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00
		25	0.00	0.00	0.00	0.00
	15	0.00	0.00	0.00	0.00	
	5	0.00	0.00	0.00	0.00	

**Metro TCN Lighting Study**
**VP-15A**

		Distance (ft)														
		5	15	25	35	45	55	65	75	85	95	105	115	125	135	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

**VP-15A**

		Distance (ft)															
		145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		











VP-15A

		Distance (ft)																
		1585	1595	1605	1615	1625	1635	1645	1655	1665	1675	1685	1695	1705	1715	1725	1735	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10		

VP-15A

		Distance (ft)																
		1745	1755	1765	1775	1785	1795	1805	1815	1825	1835	1845	1855	1865	1875	1885	1895	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	
		185	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		175	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		165	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		145	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		125	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		115	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		105	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		95	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		85	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		75	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		65	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		55	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		45	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		35	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00
25	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00		
15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00		
5	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00		



# Metro TCN Lighting Study

## VP-15A

Distance (ft)		1905	1915	1925	1935	1945	1955	1965	1975	1985	1995	2005	2015	2025	2035	2045	2055
Vertical Illuminance (fc)	Elevation (ft above grade)																
	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	135	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	125	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	115	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	105	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	95	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	85	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	75	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	65	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	55	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	45	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

## VP-15A

Distance (ft)		2065	2075	2085	2095	2105	2115	2125	2135	2145	2155	2165	2175	2185
Vertical Illuminance (fc)	Elevation (ft above grade)													
	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	



**VP-20A**

		Distance (ft)														
		5	15	25	35	45	55	65	75	85	95	105	115	125	135	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

**VP-20A**

		Distance (ft)																	
		145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295		
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	
		145	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	
		135	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20
		125	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20
		115	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30
		105	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.30	0.30	0.30	0.30	0.30
		95	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.30	0.30	0.40	0.40	0.50	0.50	0.50
		85	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.30	0.30	0.40	0.50	0.60	0.60	0.80	0.80
		75	0.00	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.30	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.90
		65	0.00	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.30	0.40	0.50	0.70	0.80	1.00	1.10	1.20	1.20
		55	0.00	0.10	0.10	0.10	0.10	0.20	0.20	0.30	0.30	0.50	0.60	0.80	1.00	1.30	1.50	1.60	1.60
		45	0.00	0.10	0.10	0.10	0.10	0.20	0.20	0.30	0.40	0.50	0.70	0.90	1.20	1.50	1.80	2.00	2.00
		35	0.00	0.10	0.10	0.10	0.10	0.20	0.20	0.30	0.40	0.60	0.80	1.00	1.40	1.80	2.10	2.30	2.30
25	0.00	0.10	0.10	0.10	0.10	0.20	0.20	0.30	0.40	0.60	0.80	1.10	1.40	1.80	2.20	2.50	2.50		
15	0.00	0.10	0.10	0.10	0.10	0.20	0.20	0.30	0.40	0.50	0.70	1.00	1.40	1.80	2.20	2.40	2.40		
5	0.00	0.10	0.10	0.10	0.10	0.10	0.20	0.30	0.40	0.50	0.70	0.90	1.20	1.60	1.90	2.10	2.10		

**Metro TCN Lighting Study**
**VP-20A**

Distance (ft)		305	315	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00
		185	0.10	0.10
		175	0.10	0.10
		165	0.10	0.10
		155	0.10	0.10
		145	0.10	0.10
		135	0.20	0.10
		125	0.20	0.20
		115	0.30	0.30
		105	0.30	0.30
		95	0.50	0.50
		85	0.60	0.60
		75	0.90	0.80
		65	1.20	1.10
		55	1.60	1.50
		45	2.00	1.80
35	2.40	2.20		
25	2.50	2.30		
15	2.40	2.20		
5	2.10	1.90		

**VP-26A**

Distance (ft)		5	15	25	35	45	55	65	75	85	95	105	115	125	135		
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		



**Metro TCN Lighting Study**
**VP-26A**

		Distance (ft)																
		465	475	485	495	505	515	525	535	545	555	565	575	585	595	605	615	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.10	0.00	0.10	0.00	0.00	0.00	0.00
		145	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.10	0.00
		135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00
		105	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.00	0.00	0.00
		95	0.20	0.20	0.20	0.10	0.10	0.10	0.00	0.10	0.00	0.10	0.00	0.00	0.00	0.00	0.10	0.00
		85	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.00	0.10	0.00	0.00
		75	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.00	0.10	0.00	0.10	0.00	0.00	0.10	0.00	0.00
		65	0.10	0.20	0.20	0.10	0.10	0.10	0.10	0.00	0.10	0.00	0.00	0.00	0.00	0.10	0.00	0.00
		55	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		25	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

**VP-26A**

		Distance (ft)																
		625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.00	0.00	0.00	0.00		



**Metro TCN Lighting Study**
**VP-26A**

		Distance (ft)								
		1105	1115	1125	1135	1145	1155	1165	1175	
<b>Vertical Illuminance (fc)</b>	<b>Elevation (ft above grade)</b>	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

**VP-28A**

		Distance (ft)														
		5	15	25	35	45	55	65	75	85	95	105	115	125	135	
<b>Vertical Illuminance (fc)</b>	<b>Elevation (ft above grade)</b>	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		





**Metro TCN Lighting Study**
**VP-28A**

		Distance (ft)																
		465	475	485	495	505	515	525	535	545	555	565	575	585	595	605	615	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		145	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		125	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		115	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		105	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		95	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		85	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		75	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		65	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		55	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		45	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
		35	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00
25	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00		
15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00		
5	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00		

**VP-28A**

		Distance (ft)															
		625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		



**VP-28A**

		Distance (ft)																
		785	795	805	815	825	835	845	855	865	875	885	895	905	915	925	935	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

**VP-28B**

		Distance (ft)													
		5	15	25	35	45	55	65	75	85	95	105	115	125	135
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.20
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.20
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.20
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.20
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10		

**Metro TCN Lighting Study**
**VP-28B**

		Distance (ft)																
		145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		145	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		135	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.10
		125	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10
		115	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10
		105	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10
		95	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10
		85	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10
		75	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10
		65	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10
		55	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10
		45	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10
		35	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10
25	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10		
15	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.10		
5	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10		

**VP-28B**

		Distance (ft)																	
		305	315	325	335	345	355	365	375	385	395	405	415	425	435	445	455		
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00
		145	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00
		135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00
		125	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00
		115	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		105	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		95	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		85	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		75	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00
		65	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		55	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		45	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		35	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
25	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00		
15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00		
5	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00		



VP-28B

		Distance (ft)																
		465	475	485	495	505	515	525	535	545	555	565	575	585	595	605	615	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

VP-28B

		Distance (ft)				
		625	635	645	655	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00
	25	0.00	0.00	0.00	0.00	
	15	0.00	0.00	0.00	0.00	
	5	0.00	0.00	0.00	0.00	

**Metro TCN Lighting Study**
**VP-29A**

		Distance (ft)														
		5	15	25	35	45	55	65	75	85	95	105	115	125	135	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		185	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		175	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		165	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		155	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		145	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		135	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		125	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		115	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		105	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		95	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		85	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		75	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		65	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		55	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		45	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
35	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
25	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
15	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
5	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		

**VP-29A**

		Distance (ft)																
		145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		145	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30
		135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30
		125	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30
		115	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30
		105	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30
		95	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30
		85	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30
		75	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30
		65	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30
		55	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30
		45	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.30
35	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30		
25	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30		
15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30		
5	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20		



**VP-29A**

		Distance (ft)																
		305	315	325	335	345	355	365	375	385	395	405	415	425	435	445	455	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.20	0.20	0.20	0.20	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20
		185	0.20	0.20	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
		175	0.20	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
		165	0.20	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30
		155	0.30	0.30	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.30
		145	0.30	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
		135	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.50	0.40	0.40
		125	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.40
		115	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.50	0.50	0.60	0.50	0.50
		105	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.50
		95	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.60	0.60
		85	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.60	0.60
		75	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.60	0.60
		65	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.60	0.60
		55	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.50
		45	0.30	0.30	0.30	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.60	0.60	0.60	0.60	0.60	0.50
		35	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
25	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.40		
15	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.50	0.40	0.40		
5	0.30	0.30	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40		

**VP-29A**

		Distance (ft)																
		465	475	485	495	505	515	525	535	545	555	565	575	585	595	605	615	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.20	0.20
		185	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.30	0.30
		175	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.30	0.30	0.30
		165	0.30	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.30	0.30	0.30	0.30
		155	0.30	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.30	0.30	0.30	0.30	0.30
		145	0.30	0.30	0.20	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20	0.30	0.30	0.40	0.40	0.40
		135	0.40	0.30	0.20	0.20	0.20	0.20	0.20	0.10	0.20	0.20	0.30	0.30	0.40	0.40	0.40	0.40
		125	0.40	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.40	0.40	0.40	0.50	0.50
		115	0.40	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.50	0.50
		105	0.40	0.40	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.50	0.50
		95	0.50	0.40	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.20	0.30	0.50	0.50	0.60	0.60	0.60
		85	0.50	0.40	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.20	0.30	0.50	0.50	0.60	0.60	0.60
		75	0.50	0.40	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.20	0.30	0.50	0.50	0.60	0.60	0.60
		65	0.50	0.40	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.20	0.30	0.50	0.60	0.60	0.60	0.60
		55	0.50	0.40	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.20	0.30	0.50	0.50	0.60	0.60	0.60
		45	0.40	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.60	0.50
		35	0.40	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.50	0.50
25	0.40	0.30	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.20	0.30	0.40	0.40	0.50	0.50	0.50		
15	0.30	0.30	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.30	0.40	0.40	0.40	0.40	0.50		
5	0.30	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.30	0.40	0.40	0.40	0.40		

**Metro TCN Lighting Study**
**VP-29A**

		Distance (ft)																
		625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10
		185	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		175	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		165	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		155	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		145	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		135	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20
		125	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
		115	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
		105	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
		95	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
		85	0.60	0.50	0.50	0.50	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
		75	0.50	0.50	0.50	0.50	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
		65	0.60	0.50	0.50	0.50	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
		55	0.50	0.50	0.50	0.50	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
		45	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
		35	0.50	0.50	0.50	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
25	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20		
15	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20		
5	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20		

**VP-29A**

		Distance (ft)																
		785	795	805	815	825	835	845	855	865	875	885	895	905	915	925	935	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		145	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		135	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		125	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		115	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		105	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		95	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		85	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		75	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		65	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		55	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		45	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		35	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
25	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
15	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
5	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		





**Metro TCN Lighting Study**
**VP-33A**

		Distance (ft)																
		145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

**VP-33A**

		Distance (ft)																
		305	315	325	335	345	355	365	375	385	395	405	415	425	435	445	455	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		



**Metro TCN Lighting Study**
**VP-33B**

		Distance (ft)														
		5	15	25	35	45	55	65	75	85	95	105	115	125	135	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		145	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		125	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		115	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		105	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		95	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		85	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		75	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		65	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		55	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		45	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		35	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
25	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
15	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10		

**VP-33B**

		Distance (ft)																
		145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		35	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		



VP-33B

		Distance (ft)																	
		305	315	325	335	345	355	365	375	385	395	405	415	425	435	445	455		
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	
		185	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		175	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		165	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		155	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		145	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		135	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		125	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		115	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		105	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		95	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		85	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		75	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		65	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		55	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		45	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		35	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
25	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		
15	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00		

VP-33B

		Distance (ft)	465
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10
		185	0.10
		175	0.10
		165	0.10
		155	0.10
		145	0.10
		135	0.10
		125	0.10
		115	0.10
		105	0.10
		95	0.10
		85	0.10
		75	0.10
		65	0.10
		55	0.10
		45	0.10
		35	0.10
25	0.10		
15	0.00		
5	0.00		

**Metro TCN Lighting Study**
**VP-34A**

		Distance (ft)														
		5	15	25	35	45	55	65	75	85	95	105	115	125	135	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

**VP-34A**

		Distance (ft)															
		145	155	165	175	185	195	205	215	225	235	245	255	265	275	285	295
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		



VP-34A

		Distance (ft)																
		305	315	325	335	345	355	365	375	385	395	405	415	425	435	445	455	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
		185	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
		175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
		165	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
		155	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
		145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
		135	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
		125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
		115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
		105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
		95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
		85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
		75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
		65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
		55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
		45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
		35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
		25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

VP-34A

		Distance (ft)																
		465	475	485	495	505	515	525	535	545	555	565	575	585	595	605	615	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10
		185	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10
		175	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		165	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20
		155	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20
		145	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
		135	0.40	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
		125	0.50	0.50	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
		115	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
		105	0.50	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
		95	0.50	0.50	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20
		85	0.50	0.50	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20
		75	0.50	0.50	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20
		65	0.50	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
		55	0.50	0.50	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.20	0.20	0.20	0.20
		45	0.50	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
		35	0.50	0.50	0.50	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
		25	0.50	0.40	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20
15	0.40	0.40	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20		

VP-34A

		Distance (ft)														
		625	635	645	655	665	675	685	695	705	715	725	735	745	755	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		155	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		145	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		135	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		125	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		115	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		105	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		95	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		85	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		75	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		65	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		55	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		45	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		35	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
25	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00		
15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00		
5	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00		

VP-34B

		Distance (ft)														
		5	15	25	35	45	55	65	75	85	95	105	115	125	135	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.10
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20
		145	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		125	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		115	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		105	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		95	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		85	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		75	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		65	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		55	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		45	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
		35	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20
25	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20	0.20		
15	0.10	0.10	0.10	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.20		
5	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.20	0.10		





VP-34B

		Distance (ft)																
		465	475	485	495	505	515	525	535	545	555	565	575	585	595	605	615	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		185	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		175	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		165	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		155	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		145	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		135	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		125	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		115	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		105	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		95	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		85	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		75	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		65	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		55	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		45	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		35	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		25	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
		15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00
		5	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

VP-34B

		Distance (ft)				
		625	635	645	655	
Vertical Illuminance (fc)	Elevation (ft above grade)	195	0.10	0.10	0.10	0.10
		185	0.10	0.10	0.10	0.10
		175	0.10	0.10	0.10	0.10
		165	0.10	0.10	0.10	0.10
		155	0.10	0.10	0.10	0.10
		145	0.10	0.10	0.10	0.10
		135	0.10	0.10	0.10	0.10
		125	0.10	0.10	0.10	0.10
		115	0.10	0.10	0.10	0.10
		105	0.10	0.10	0.10	0.10
		95	0.10	0.10	0.10	0.10
		85	0.10	0.10	0.10	0.10
		75	0.10	0.10	0.10	0.10
		65	0.10	0.10	0.10	0.10
		55	0.10	0.10	0.10	0.10
		45	0.10	0.10	0.10	0.10
		35	0.10	0.10	0.10	0.10
25	0.10	0.10	0.10	0.10		
15	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00		