Technical Report
LAX Master Plan EIS/EIR

9. Light Emissions Technical Report

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Prepared for:

Los Angeles World Airports
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1.0 INTRODUCTION

This report assesses the potential effects of light emissions associated with the Los Angeles International Airport (LAX) Master Plan Alternatives to result in lighting impacts through a comparison of environmental baseline conditions to conditions proposed under the alternatives. This report has been prepared in support of the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the LAX Master Plan pursuant to the National Environmental Policy Act (NEPA) and the California Environmental Quality Act. The report discusses relevant standards, plans, regulations and guidelines; existing lighting conditions and sensitive receptors; thresholds of significance; methodology; and the potential for adverse lighting effects with development proposed under the LAX Master Plan. The evaluation of potential effects determines whether the proposed development would result in the spill-over of light onto adjacent light-sensitive receptors (i.e., residential uses and institutional uses) affecting occupant vision, sleep, or privacy. Potential effects associated with changes in ambient lighting conditions found on the western end of the airport property in the El Segundo Blue Butterfly Habitat Restoration Area are also discussed.

2.0 GENERAL APPROACH AND METHODOLOGY

A light source emits luminous power which is measured in candlepower (*cp*). The unit used to measure illumination is the footcandle (*fc*) which represents the illumination cast by a one-*cp* light source on an area of one square foot, measured at a distance of one foot from the light source. For a point of reference, illumination associated with natural conditions ranges from 0.004 *fc* for a moonless night, 25.0 *fc* for dawn and 125.0 *fc* for a bright day.[1] Footcandle measurements associated with a number of natural conditions are shown in **Table 1**, Range of Natural Variation of Illuminance. Luminance or photometric brightness is the measure of reflected energy emitted from a specific source in a specific direction over a standard area. Light spill is the light that shines beyond the area intended for illumination. It is caused by the uncontrolled direct component from luminaires or light reflected from the ground surface. Light spill can be a source of annoyance on adjoining properties, particularly for residential uses when sleep or privacy is affected.

Table 1

Range of Natural Variation of Illuminance

Condition	Illuminance (footcandles)
Moonless Night	0.004
Full Moon	0.030
Twilight	20.00
Dawn	25.00
Foggy Day	15.00
Overcast Day	54.00
Bright Day Light	125.00

Source: International Committee on Illumination, March 2000

Reflective light or glare is primarily a daytime phenomenon caused by the reflection of sunlight or artificial light by highly polished surfaces such as window glass or reflective materials, and to a lesser degree from broad expanses of light-colored surfaces. Reflective light is common in urban areas, where it can be an annoyance for residents and pedestrians and can create hazards for motorists.

The study area for the analysis includes areas within existing and proposed LAX boundaries, areas along the proposed LAX Expressway right-of-way, and at the off-site fuel farm locations proposed within the Scattergood Generating Station and oil refinery fuel farm properties.

The potential light emissions impacts of the proposed build alternatives were determined by evaluation of the current facility site plans and observation of current airport light sources (i.e., parking lots, cargo complexes, street lighting); survey and documentation of existing lighting conditions and effects on sensitive receptors; and, assessment of future lighting effects based on the proposed site plans and design features of the alternatives. The objective was to identify changes in lights sources from current to

[1] International Committee on Illumination, March 2000.

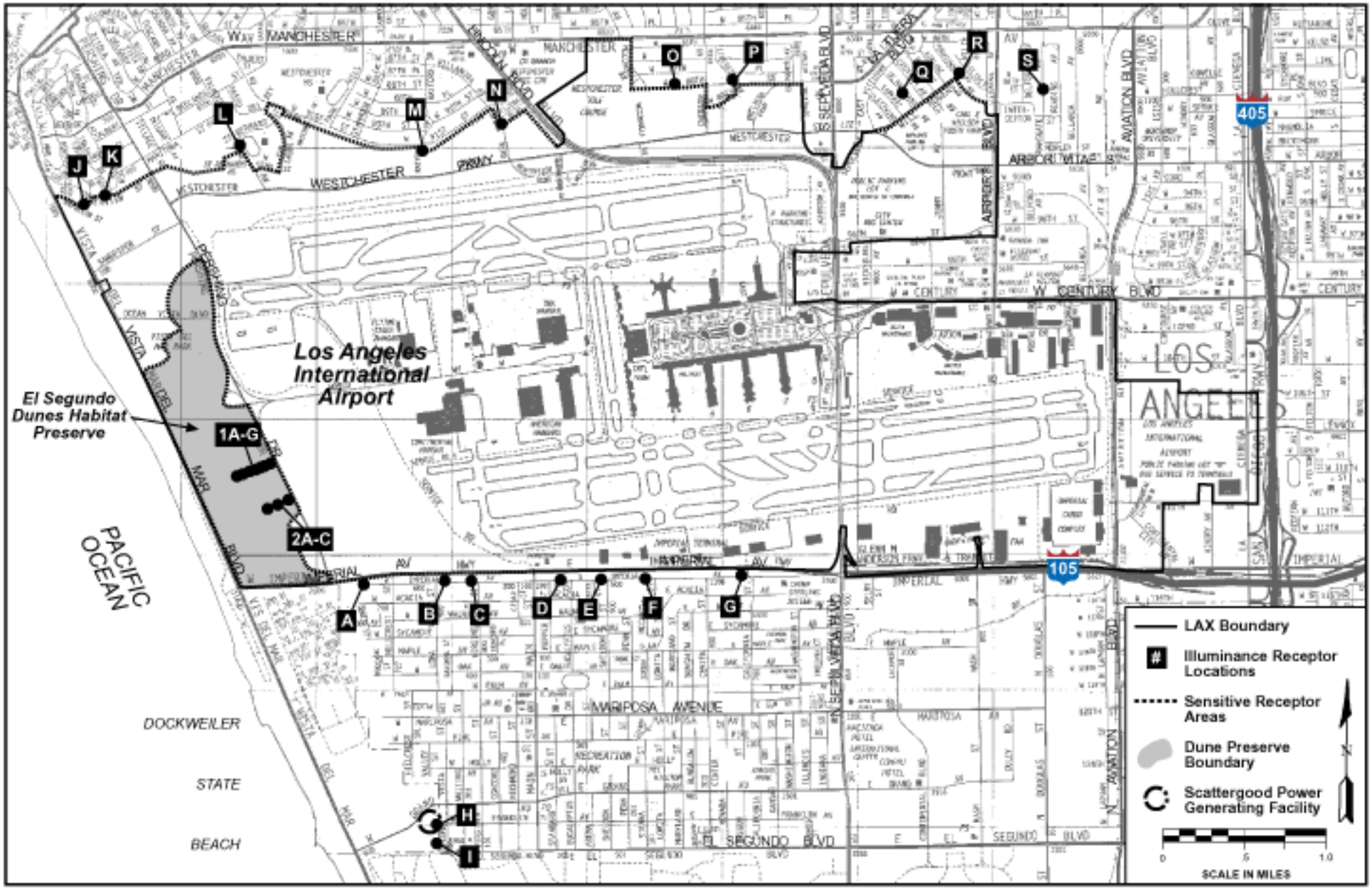
future conditions that would result in significant increases in the illumination of light-sensitive receptors (i.e., residential uses, some commercial and institutional uses, and natural areas). This objective is consistent with FAA Orders 5050.4A and 1050.1D to provide a "…description of potential annoyance from airport lighting and measures to minimize the effects…."

A series of lighting surveys were conducted at receptor site locations around the LAX facility to establish the existing lighting conditions from the viewpoint of surrounding neighborhoods. These existing conditions will serve as the baseline reference for comparison to predicted future lighting environments from the three LAX Master Plan build alternatives.

A total of nineteen receptor locations were chosen to document lighting at locations most likely to be effected by changes in lighting from proposed LAX Master Plan development. The surveys focused on four general areas:

- The southern boundary along Imperial Avenue in the City of El Segundo (since some development may occur along Imperial Highway as well as potential new parking facilities in the southwest corner of the LAX property).
- The area immediately adjacent to the Scattergood Tank Farm in the City of El Segundo (since some reconfiguration may occur at this site to expand off-airport fuel storage capacity).
- The western end of the airport, across Pershing Drive, in the El Segundo Blue Butterfly Habitat Restoration Area (Habitat Restoration Area) (since a new West Terminal is proposed that may increase light levels within the Habitat Restoration Area).
- The northern boundary in Playa del Rey and Westchester, (since current airport property in the LAX Northside Development area would be changed from open land to specific uses, and some residential areas may be purchased by the airport for future development).

The light assessments were made over 5- to 15-minute sampling periods at the selected receptor locations to quantify baseline ambient lighting levels. **Figure 1**, Illuminance Measurement Locations and Sensitive Receptor Areas, presents the location of the lighting measurements relative to the project site and nearby roadways. These locations were described in more detail in **Table 2**, Illuminance Measurement Locations.



Los Angeles International Airport Master Plan	Illuminance Measurement Locations and Sensitive Receptor Areas	Figure 1

Table 2

Illuminance Measurement Locations

Location	Description	City
A	770 W. Imperial Ave.	El Segundo
B	548 W. Imperial Ave.	El Segundo
C	424 W. Imperial Ave.	El Segundo
D	206 E. Imperial Ave.	El Segundo
E	422 E. Imperial Ave	El Segundo
F	620 E. Imperial Ave.	El Segundo
G	1208 E. Imperial Ave.	El Segundo
H	600 Block of Franklin Ave.	El Segundo
I	Loma Vista & Binder Pl.	El Segundo
J	Napoleon & Rindge Ave. (SE)	Playa del Rey
K	255 Waterview	Playa del Rey
L	9000 Block of Falmouth Ave.	Playa del Rey
M	South end of Rayford Dr.	Playa del Rey
N	Behind Apt. at 9400 La Tijera	Playa del Rey
O	6645 W. 88th St.	S. Westchester
P	8763 Liberator Ave.	S. Westchester
Q	8838 DeHavilland Ave.	Los Angeles
R	8611 Wiley Post	Los Angeles
S	8730 Ramsgate Ave.	Los Angeles
Dunes 1a	Bottom of hill, by Pershing	Habitat Restoration Area
Dunes 1b	Mid-point up hill	Habitat Restoration Area
Dunes 1c	Crest of hill	Habitat Restoration Area
Dunes 1d	Center of intersection, past Crest	Habitat Restoration Area
Dunes 1e	Proceeding down hill, 1d+100'	Habitat Restoration Area
Dunes 1f	Further down hill, 1d + 200'	Habitat Restoration Area
Dunes 1g	Still further down hill, 1d + 300'	Habitat Restoration Area
Dunes 2a	Bottom of hill, by Pershing	Habitat Restoration Area
Dunes 2b	Mid-point up hill	Habitat Restoration Area
Dunes 2c	Crest of hill	Habitat Restoration Area

Source: PCR Services Corporation, 2000

A Tektronix J17 Photometer (s/n B022200) with a Tektronix J1811 Illuminance Head was used to measure illuminance, the light energy incident at a given point, in terms of footcandles. All instrumentation was within the standard laboratory calibration cycle and all meters were operated according to the manufacturer's specifications. The measurements were conducted in late December, 1999 and early January, 2000. Each session was started at least 12 hours after civil twilight (or approximately two hours after sunset) to ensure that full darkness had taken place. Also, the phase, illumination, and position of the moon was noted to document its potential influence. In all sessions, the moon had either already set or had not risen yet, so that there was no moon visible during the measurements. In addition, meteorological conditions (air temperature, relative humidity, wind speed, and wind direction) were observed and noted, as was the latitudinal and longitudinal position using a portable GPS system.

The photometer was mounted on a tripod to provide a stable platform and to enable data acquisition at defined angles in both the vertical and horizontal planes. In the horizontal plane, measurements were made at 30E increments over 180E with 90E being nominally perpendicular to the airport facility. Note that angular difference between magnetic north and each location = S 0E was noted to maintain future repeatability. In the vertical plane, measurements were made at +30E (i.e. looking skyward) and -30E (i.e. looking toward the ground) to further evaluate indications glare, reflections, and spill-over from local sources not connected to the airport. These vertical plane measurements were also made at the same 30E increments from 0E to 180E. Thus, there were a total of 21 illuminance values acquired at each ambient location (seven looking toward the sky, seven looking horizontally, and 7 looking toward the ground).[2] The stable value for illuminance at each angular setting was read from the photometer's digital meter and was noted on field data sheets. Also noted for each reading was what the photometer's

[2] The only exception to this was for selected locations in the Dunes Habitat Preserve wherein the measurements were intended to document the fall-off of the airport light as one moved away from the airport and down the backside of the dunes hills. In these measurements, the +30° and -30° and vertical plane measurements were omitted as well as the significantly off-center horizontal plane measurements.

illuminance head was nominally pointed at to provide a narrative descriptor of the light source or lit object that was controlling the indicated value (e.g., street light, open sky, airport terminal, ground, etc.) The Field Data sheets are attached as *Attachment A*.

The measured illuminance values ranged from 0.03 to 0.63 footcandles for the southern areas (on Imperial Ave), from 0.01 to 1.37 footcandles for the proposed Scattergood Fuel Farm site, from 0.01 to 0.37 footcandles for the northern areas (Playa del Rey and Westchester), and 0.004 to 0.26 footcandles for the Habitat Restoration Area. The full range of measurements taken for ambient illuminance are presented in tabular form in *Attachment B.*

For the assessment of possible future conditions, measurements were made at nearby existing land uses that were felt to be representative of planned developments. For example, measurements were made at TRW, Inc. facilities in Manhattan Beach to simulate future R&D/Office space developments. For these future condition representations, the photometer was kept in the horizontal plane and moved through the angular span that would encompass the width of the general light source. The average or nominal range of footcandle values for the existing use was noted on field data sheets. These representative lighting sources are summarized in **Table 3**, Reference Measurements For Illuminance Ratings From Existing Sources.

Table 3

Reference Measurements for Illuminance Ratings from Existing Sources

Location	Description	City	Average Horizontal Illuminance (*fc*)	Notes
1	Car Rental Area @ 700'	Los Angeles	0.279	On 93rd St. perpendicular to Avis & Nat'l Rentals
2	Car Rental Area @ 350'	Los Angeles	0.036-0.046	On 93rd St. perpendicular to Avis & Nat'l Rentals
3	Parking Lot @ 300'	Los Angeles	0.185	Parking Lot C, near Nielson Park (Wiley Post & Airlane)
4	Parking Lot @ 100'	Los Angeles	0.440	Parking Lot C, general lighting (Wiley Post & Croydon)
5	Parking Lot @ 100'	Los Angeles	1.200	Parking Lot C, entire lot (Wiley Post & Kittyhawk)
6	R&D Business Park, parking	Manhattan Beach	0.350-0.800	TRW R&D facility parking lot
7	R&D Business Park, parking	Manhattan Beach	0.120	TRW R&D facility parking lot
8	R&D Business Park, back side	Manhattan Beach	0.650-0.780	TRW R&D facility mechanical area, receiving, work access
9	R&D Business Park, work yard	Manhattan Beach	0.450-0.540	TRW R&D facility work area and storage yard
10	Airport Terminal @ 3000'	Santa Ana	0.077	Top of Parking Structure by Irvine Health Club over a/p
11	Airport Terminal @ 750'	Santa Ana	0.320-0.390	On Business Center Drive perp to SNA (John Wayne) a/p
12	Cargo Facilities @ 300'	El Segundo	0.210	Representative data from Imperial Ave. ambient survey
13	Cargo Facilities @ 750'	El Segundo	0.100	Representative data from Imperial Ave. ambient survey
14	Recreational Facilities @ 50'	Westchester	1.000	Parking area by Westchester Golf/Tennis Rec. Park
15	Berms @ 50'	S. Westchester	0.060	Representative data from S. Westchester ambient survey
16	Commercial @ 50', front, bright	Westchester	6.400-7.000	Ralph's shopping center
17	Commercial @ 50', front, reduced	Westchester	0.680-0.830	Mervyn's shopping center (more directed lights, downward)
18	Commercial @ 100', side/back	Westchester	5.700	Ralph's shopping center

Source: PCR Services Corporation, 2000

Lighting increases in residential areas and in the Habitat Restoration Area were estimated from the transposition of the reference illuminance source on the alternative area using the principle of illuminance = candlepower/distance.[2] The most likely affected receptors identified in the field surveys were used to estimate the change in illuminance from existing ambient conditions to future ambient conditions expected with new development under each Master Plan alternative. Conclusions regarding impacts take into account offsetting effects associated with proposed Master Plan Commitments and adherence to current airport lighting guidelines.

3.0 AFFECTED ENVIRONMENT/ENVIRONMENTAL BASELINE

Relevant Plans, Regulations and Guidelines

The following discussion addresses relevant local plans, zoning regulations and other approvals that are in effect both on and off the airport within the light emissions study area. These plans and policies, in addition to the existing conditions described below, establish the baseline conditions to which the Master Plan alternatives will be compared when assessing their future lighting effects.

Airfield and Navigational Lighting Standards and Characteristics

The FAA prescribes standards for airfield and terminal area lighting aids and navigational systems at all U.S. airports. Provided to facilitate aircraft identification, approach/landing, takeoff, and taxiing operations at night and in adverse weather conditions, this lighting includes:

- **Airport Beacons:** Beacons are located not more than 1,500 meters from the nearest point of the usable landing areas and show alternating white and green flashes.
- **Approach Lighting:** Approach lights provide visual information during the last stages of aircraft approach to a landing. There are several approach lighting systems varying in light intensity. The approach lighting systems consist of a series of light bars spaced along the extended runway centerline; runway alignment indicator sequentially flashing lights extending 2,400 feet from the runway end; flashing runway identifier lights located near the landing threshold of a runway; and visual approach descent indicators to aid operations in Visual Flight Rule (VFR) conditions.
- **Runway/Taxiway Guidance Lighting:** Runway/taxiway visual aids are installed to provide guidance to aircraft landing, taking off, or operating on the airport surface:
  Runway edge lighting is located along the runway edge, not more than ten feet from the edge of the pavement. The longitudinal spacing of the lights should not exceed 200 feet. These lights emit white (clear) light and are capable of five intensities. The last 2,000 feet of each end of the runway consists of amber lights that face the aircraft as it completes its landing roll.

  Runway identifier lights (also known as runway end identifier lights, REIL) are a pair of white flashing lights located near the threshold of a runway. A typical REIL layout is two lights located 40 to 75 feet on both sides of the runway, 10 feet ahead of the runway threshold, maximum, and turned 15 degrees away from the runway centerline. REIL are two simultaneously flashing white lights, and may be either unidirectional or omnidirectional. Intensity may be variable.

  Runway centerline lighting is intended to provide after touch-down rollout and take-off guidance. They are white, non-flashing, variable-intensity luminaries along the length of the runway, with the exception that, between 300 and 900 meters, the lights alternate red and white and for the last 300 meters of the runway, the lights are all red.

  Taxiway edge lighting is a configuration of lights that define the perimeter of the usable taxiing area. The luminaries are located less than 10 feet from the edge of the taxiway pavement. Taxiway edge lights are continuously burning blue lights that vary in intensity.

  Taxiway centerline lights are provided, intended for use in conditions where the visual range will be less than 360 meters, and are recommended for all airports with runways having precision approach procedures, particularly at high traffic density airports such as LAX. These lights are steadily burning lights of variable intensities of green.
- **Apron/Ramp Floodlighting and Ground Lighting/Marking:** Apron/ramp lighting consists of aircraft route guidance and general area floodlighting.
- **Aeronautical Obstruction Identification:** Any object that penetrates an established set of imaginary planes or exceeds a height of 60 meters at the airport site may be required to be marked or lighted. Three commonly used lighting systems are: aviation red obstruction lights, high intensity white obstruction lights, consisting of flashing white lights; and dual lighting, which is a combination of aviation red obstruction lights for night operation and high-intensity white lights for daytime operations.

Los Angeles International Airport Interim Plan

The Community Plan currently in effect for LAX is the Los Angeles International Airport Interim Plan adopted by City Council in January 1981. The Interim Plan was intended as a short term, general guide for coordinating the development of airport facilities with that of the surrounding communities. The Plan

remains in effect until a new Master Plan document is adopted by the City Council. Relative to lighting, the Interim Plan stipulates that: "Glare . . . resulting from airport operations facilities shall be maintained at the boundaries of the Airport at an acceptable level.[3]" The Interim Plan includes features such as an Airport Buffer Area "located along the northerly and southerly boundaries of the airport, to shield adjoining residential properties from noise, glare, odor, vibration and other consequences of aircraft and airport operations." The Interim Plan further discusses the construction of both a landscaped barrier between the airport and the community designed to take into account its visual impact, including point light sources.

LAX Northside Design Plan and Development Guidelines

As changes in development are proposed for the Westchester Southside Development area (formerly the site of the proposed LAX Northside project) existing LAX Northside guidelines and ordinance provisions addressing lighting in this area are relevant to this evaluation. Design Plan and Development Guidelines for LAX Northside Development state: “The positive night time image of LAX Northside is important because it conveys a safe, secure, well designed, and organized development area. Special lighting of areas such as key intersections, transit stops and public plazas will greatly enhance the aesthetic character of the development area. The use of special lighting will be accomplished without impacting the surrounding neighborhoods or airport operations.” One of the conditions imposed on approval for the LAX Northside Development states “All lighting shall be directed onto the site and no flood-lighting shall be located as to be seen directly by the adjacent residential areas. This condition shall not preclude the installation of low-level security lighting.” The City ordinance establishing Qualifying [Q] conditions (zoning conditions of approval defined as [Q] zoning conditions) for development of the LAX Northside property (Ordinance No. 159,526) also defines height restrictions, setback requirements, and landscape guidelines that also serve to reduce potentially adverse lighting effects.

City of Los Angeles Zoning and Municipal Code

The City of Los Angeles Zoning Code, Section 12.50, Airport Approach Zoning Regulations, establishes special airport zoning regulations regulating land use around LAX in order to prevent the creation or establishment of airports hazards. These zoning regulations are primarily directed toward height limits but also contain references to light emissions; such as, potential hazards to aircraft resulting from illuminated signs and structures within airport hazard areas.

The City of Los Angeles Municipal Code, Section 91.6205 M. and Section 93.0117 regulate light spill-over in residential areas. These regulations would apply to development along the airport periphery. Since the City of Los Angeles Code defines a two footcandle increase for residential areas as significant, the same 2-footcandle threshold was used to determine significance of illuminance and spillover estimates for future conditions.

Los Angeles International Airport Air Cargo Facilities Design Guidelines

The Los Angeles International Airport Air Cargo Facilities Design Guidelines were developed in August 1998 as a tool to assist tenants, architects, and engineers in developing cargo facilities in the area of Century Boulevard and Aviation Boulevard. The guidelines are intended to reflect current industry standards and future design trends. Building design criteria identify primary image buildings and secondary image buildings and address ideas for relating proposed cargo structures to views from the non-aviation adjacent land use. The following building lighting guidelines are presented in the document:

- Guidelines. Lighting should be integrated into the architecture wherever possible-not applied. An overall approach toward lighting shall be developed for both primary and secondary structures. Exterior lighting shall be integrated into canopies and architectural components (i.e., parapets, site walls). For typical buildings, exterior lighting can be located off the parapet of the building and on high-mast site lighting. For buildings along Century Boulevard, the building lighting should be located under the canopy or overhang. The number of site lighting standards should be minimized and located to project light away from the hotels and office buildings.

[3] City of Los Angeles, Los Angeles International Airport Interim Plan, January 1981.

Existing Conditions

LAX Light Sources

LAX and its surrounding environment are generators of light emissions typical of highly urbanized areas. Certain airport facilities visible from the airport periphery emit intensities of light that are noticeably above average ambient light conditions.

Illumination sources associated with the Central Terminal Area (CTA) include street lights, security lights, roof perimeter lights, parapet lights, and terminal entrance lights. Hangar facilities are found immediately west of the CTA adjacent to World Way West between the north and south airfield complexes. Lighting sources include roof perimeter lights and light from the interiors of these structures. The roof perimeter and parapet lights are shielded and directed down and generally do not spill over 30 feet onto the surrounding areas. Interior light coming from hangers does not generally spill over beyond the hangar doors. While contributing to urbanized ambient light conditions, the CTA and World Way West facilities are at distances of 2,500 to 3,000 feet or more from sensitive residential receptors and cause no light spill over in residential areas on the south and north perimeters of the airport.

Lighting found on the north and south airfield complexes include aircraft lighting aids and navigational systems provided to facilitate aircraft identification, approach/landing, takeoff, and taxiing operations at night and in adverse weather conditions. This lighting includes airport beacons, approach lighting, runway/taxiway guidance lighting, and apron/ramp floodlighting and ground lighting/marking. Lighting associated with the airfields is generally low to the ground, low in intensity, and located at least 800 feet from sensitive residential receptor areas on the south and north perimeters of the airport.

The Imperial Terminal and the Imperial Cargo Complex, both adjacent to but set back over 50 feet from Imperial Highway and located on the south central and southeast areas of the airport, respectively, have a mix of light sources that are visible from commercial and/or industrial land uses located on the south side of Imperial Highway. The roof perimeter lights are shielded and directed down and do not spill off-site. The Century Cargo Complex adjacent to Century Boulevard has a ten-foot setback and lighting associated with the Complex is shielded and directed down and does not spill over off-site.

Parking Lots C and D, located in the vicinity of Sepulveda Boulevard and Westchester Parkway, have six-foot fences and walls, set within 15-foot landscaped buffers along the street frontages. The parking lot lights are similar in intensity to the adjacent streetlights. While located throughout the parking lot, these lights are not found at the perimeters, are shielded and directed down, and do not spill over beyond the parking surfaces.

Lighting on the LAX/El Segundo Dunes (Dunes), which includes the El Segundo Blue Butterfly Habitat Restoration Area (Habitat Restoration Area), west of Pershing Drive, currently consists of aeronautical obstruction identification lights and security lighting for two small buildings. This lighting, while visible, is low in profile. Street lights on Pershing Drive emit amber light and older low profile street lights found along Vista del Mar, adjacent to the Dunes, emit white light at low intensities. Pershing Drive separates the Habitat Restoration Area from developed areas of the airport to the east by over 50 feet. Airport light sources in this area east of Pershing Drive are less intense than those found on the remainder of the airport site and primarily comprise airfield lighting. Lighting on the LAX/El Segundo Dune is described in greater detail below.

Under current conditions, LAX illumination provides for the safe and secure movement of pedestrians and vehicles, and does not interfere with the nighttime visibility of control tower operators and incoming pilots. There are no buildings, structures or facilities currently on the LAX site that generate substantial adverse glare.

Existing Lighting Conditions

Of the lighting sources described above, those that are located in proximity to sensitive receptors are most pertinent for analysis. Sensitive receptors are primarily concentrated along the airport's northern and southern edges, and within the airport on the Habitat Restoration Area at the western end of the site. These areas, and sites proposed for acquisition under the build alternatives, were the focus of lighting measurements conducted to document existing lighting conditions. **Figure 1**, Illuminance Measurement Locations and Sensitive Receptor Areas (hereafter: Illuminance Measurement Locations), depicts areas of sensitive receptors and the locations of lighting measurement sites. The lighting measurement sites are further described in **Table 2**, Illuminance Measurement Locations. Existing lighting conditions in these areas are described below.

Southern Boundary

The land uses to the south of LAX in the City of El Segundo are separated by Imperial Highway, Imperial Avenue, and the Imperial Strip, a 7.35 acre passive open space corridor that parallels Imperial Highway. These three areas create a buffer between the southern boundary of LAX and the land uses located south of LAX and west of Sepulveda Boulevard. In combination with building setbacks, the land uses south of LAX and west of Sepulveda Boulevard are separated from LAX land uses by over 250 feet. Some of the adjacent sensitive receptor views of the LAX site are blocked by the parkway buffer, while others have a direct view of LAX. While LAX light sources are visible to certain residences and a hotel oriented toward LAX, the distance of at least 250 feet is such that they are not affected by light spill over or high ambient lighting levels. Current lighting levels at the receptor sites along the airports southern boundary (see **Figure 1**, Illuminance Measurement Locations, Sites A-G), range from 0.03 to 0.63 footcandles.

The office buildings along Imperial Highway located east of Sepulveda Boulevard and west of Aviation Boulevard contribute to the illumination in the immediate area with their own light sources, which include illuminated exterior walls, building security lighting, light emanating from building interiors, illuminated signs, and parking lot lights.

Western Boundary

The LAX/El Segundo Dunes (Dunes) are located at the west end of the LAX property, between Pershing Drive and Vista del Mar. An approximately 200 contiguous acres portion of the Dunes are designated as the El Segundo Blue Butterfly Habitat Restoration Area (Habitat Restoration Area), located approximately between Imperial Highway and World Way West. This area i is being preserved to maintain and promote natural conditions and habitat that support the endangered El Segundo Blue Butterfly and other sensitive species. Lighting on the Dunes currently consists of navigational aids and security lighting. Existing light sources associated with navigation aids consist of two instrument landing system localizers, two middle markers, Approach Lighting Systems (ALS) and building security lights. The approach lights found in the Dunes consist of 14 ALS light standards each containing six steady burning lights and 14 ALSF-2 flashing approach lights. Five ALS and ALSF-2 standards are currently located in the Habitat Restoration Area.

A series of lighting measurements were obtained to assess the landing light systems in the Dunes, to the west of the north runways. The lighting systems in the Dunes area are only used under two conditions, 1) after midnight when planes approach from the west, and 2) during “Santa Ana” conditions when aircraft land from the west. There are 5 different lighting settings from 1 (dimmest) to 5 (brightest), with 5 only being use during very foggy weather. Typically the setting is 3, which is what the lights were set at for the field measurements. Depending on the angle of the measurement, maximum readings for the ASF light systems at a distance of 4 feet ranged from 0.13 to 14.31 *fc*. For the ALSF-2 lights, which when operative flash about 2 times per second, maximum readings at 4-feet from the lamp, depending on angle, ranged from 0.46 to 9.05 *fc*.

The ALS light systems are a series of 6 lamps mounted on a horizontal light bar, about 5-feet above grade. The maximum reading at 4-feet above ground pointed directly at the lamps (centerline) was 14.31 footcandles. At 45 degrees the reading was 1.26 and at 90 degrees 0.13 footcandles. These lamps are constantly on under the conditions described above.

The ALSF-2 lights are the strobe lights which guide pilots into the runway. The ALSF-2 are a series of single lights which flash about 2 times per second. They are on pedestals about 4.5 feet in height, and are orientated 10 to 15 degrees above horizontal. The maximum reading obtained was at 4-feet from the lamp, orientated directly at the lamp was 9.05 footcandles. At 45 degrees offset from the lamp the reading was 5.52 at 4-feet, and at 90 degrees the reading was 0.046.

There are motion sensitive security lights on the radar/radio building on the southern edge of the Dunes. A direct reading of these security lights, in the immediate downward facing arc of the two flood bulbs was 44.05 footcandles for an area of four feet in diameter. At a distance of 15-feet from the flood light area the illuminance was 7.93 footcandles. At 30 feet from the flood light area the illuminance was 2.46 foot-candles. All of the security lights were on motion detection settings and went off when the motion stopped.

Street lights on Pershing Drive emit amber light and older low profile street lights found along Vista del Mar adjacent to the Dunes emit white light at low intensities. Some light spill to the Habitat Restoration Area from these streetlights does occur with the extent of coverage varying depending on Habitat Restoration Area topography and the height of adjacent light standards. Greater spill over occurs along Pershing Drive where the streetlights are higher, particularly on the westside of the World Way West

overpass where a grouping of high non-amber light standards illuminate a wide area. Lighting measurements taken within the southern half of the Habitat Restoration Area with lighting exposure from Pershing Drive ranged from 0.004 to 0.26 footcandles (**Figure 1**, Illuminance Measurement Locations, Sites 1A-G and 2A-C).

Northern Boundary/LAX Northside Development

The residential area north of LAX and west of Sepulveda Boulevard is separated by at least 1,000 feet from existing airport facilities by the Westchester Parkway and the vacant LAX Northside Development area. Where direct views of LAX are available, they are distant and generally look across the dimly and unlit Dunes or the LAX Northside Development area (except for the Westchester Golf Course). The Westchester Golf Course provides lighting for evening golf course use. This lighting is visible from surrounding off-site areas. Lighting measurements along this northern boundary (see **Figure 1**, Illuminance Measurement Locations, Sites J-P), ranged from 0.01 to 0.37 footcandles. The residential area north of LAX and east of Sepulveda Boulevard is adjacent to existing airport parking facilities. Parking lot lighting is visible from surrounding off-site areas. Lighting measurements along this portion of the northern boundary (see **Figure 1**, Illuminance Measurement Locations, Sites Q-S), ranged from 0.02 to 0.25 footcandles.

Century Corridor

Light sources along Century Boulevard, adjacent to the LAX Century Cargo Complex, include light from billboards, hotels, commercial buildings, and street lights. In general, illuminance emanating from this area is more noticeable than that from the airport site. The hotel buildings along Century Boulevard are the only light sensitive receptors within these areas. There is no spill-over onto the hotel buildings from airport sources and airport lighting effects are generally less apparent than the hotel's own environmental lighting.

The areas proposed for acquisition along the Airport's east perimeter and Century Boulevard corridor under the build alternatives are fully urbanized and developed with a mix of residential, commercial and industrial uses. The levels of lighting are typical of an urbanized area, and there are no major light sources that conflict with adjacent uses or interference with aviation activity.

Proposed LAX Expressway Right-of-Way

Potential sensitive receptors adjacent to the proposed LAX Expressway right-of-way (ROW) are single and multi-family residential units found along the south side of Thornburn Street and the north side of 74th Street and Midfield Avenue. The residences face away from the proposed LAX Expressway ROW, Centinela Creek, and the 405 Freeway. While street and vehicle lights from the I-405 Freeway are visible at night from the rear windows of these residences, the grade difference, setback, and landscape buffers between the freeway and these properties are such that direct light spillover does not currently occur. A more detailed and comprehensive description of existing conditions for these and other areas along the proposed LAX Expressway ROW is provided in Appendix K, *Supplemental Environmental Evaluation for LAX Expressway and State Route 1 Improvements*.

Proposed LAX Off-Site Fuel Farm Sites

The multi-family and single family homes along the west side of Loma Vista Street in El Segundo are directly adjacent to the southeast boundary of the LADWP Scattergood Generating Station. Existing lighting on this portion of the LADWP site, which is one of two sites in close proximity to LAX that is being considered for the construction of an off-site fuel farm, is limited to a few streetlights and limited pole-mounted lighting used for security and to illuminate areas surrounding the water tanks currently located on the site. Most of the site is dimly lit and there are no significant light spill over from the proposed fuel farm site is currently affecting adjacent residential uses along Loma Vista Street. Lighting measurements along this residential interface with the proposed fuel farm site range from 0.01 to 1.37 footcandles, which are levels that do not conflict with residential uses. There are no sensitive receptors located within a quarter mile of the proposed oil refinery fuel farm site, which is located internal to the Chevron site.

4.0 THRESHOLDS OF SIGNIFICANCE

CEQA Thresholds of Significance

A significant light emissions impact would occur if the direct and indirect changes in the environment that may be caused by the particular build alternative would potentially result in one or more of the following future condition:

- An increase in lighting intensity of more than two footcandles as measured at the property line of a residential property.

A significant glare (reflected light) impact would occur if the direct and indirect changes in the environment that may be caused by the particular project alternative would potentially result in the following future condition:

- Installation of lighting or signage within an airport hazard area that would make it difficult for pilots to distinguish between said lights and aeronautical lights, or result in glare in the eyes of pilots that would impair their ability to operate aircraft.[4]

These thresholds of significance are utilized because they address the potential concerns relative to light and glare emissions associated with the Master Plan alternatives, namely spill-over of light on sensitive uses and introduction of glare that would impair operation of aircraft. The first threshold reflects general direction provided in the *Draft L.A. CEQA Thresholds Guide*, and specifies the 2-footcandle increase from the City of Los Angeles Municipal Code. The second threshold is also derived from the City of Los Angeles Municipal Code.

Federal Standards

Although there are no federal standards that specifically define the significance of light emission impacts, FAA Orders 5050.4A and 1050.1D, state that Light Emission impacts are to be discussed as follows, "The sponsor shall consider the extent to which any lighting associated with an airport action will create an annoyance among people in the vicinity of the installation. The following information shall be included in the environmental assessment whenever the potential for annoyance exists:

Site location of lights or light systems.

- A brief description of the light system as to its purpose, method of installation (pole or ground mounted), beam angle, intensity, color, flashing sequence, and other pertinent characteristics of the particular system and its use.
- Measures to lessen any annoyance, such as shielding or angular adjustments.

Only in unusual circumstances, as for example when high intensity strobe lights would shine directly into people's homes, will the impact of light emissions be considered sufficient to warrant special study and a more detailed examination of alternatives in an environmental impact statement. Normally, it may be concluded that no significant impact would occur."

The description of potential annoyance from airport lighting and measures to minimize the effects as described above "will usually be sufficient for an environmental impact statement, in which case no further analysis is necessary. Further consideration may concentrate on previously unconsidered Mitigation Measures and alternatives."

5.0 MASTER PLAN COMMITMENTS

As concluded in the next section, Section 6.0, *Environmental Consequences*, implementation of Master Plan Alternative B would have potential light emission impacts related to the ring road. In recognition of these potential impacts, LAWA has included the commitments listed below coded "LI" for "light emissions."

- **LI-1. Ring Road Landscaping.**

  Under Alternative B, prior to approval of final plans for the ring road and the roadway proposed to connect Airport Boulevard to Bellanca Avenue, the alignments of these roadways will be modified by LAWA to provide a minimum 20-foot landscaped setback between residential properties on Morely

[4] Threshold derived from City of Los Angeles Municipal Code, Section 12.50.

Street. Said plans shall also locate and direct lighting to avoid direct glare or light spillover effects on the residential properties. Baseline measurements of ambient lighting will be made prior to construction of the ring road, the baseline data shall be used to estimate potential change in ambient lighting conditions with development of the ring road. Plantings within the setback shall include dense evergreen trees and other vegetation selected and located so that roadway lighting is sufficiently screened to ensure that lighting intensity does not increase by more than 2 footcandles over existing levels at the property lines of affected residential uses. Aesthetic enhancement of views along the ring road shall also be achieved.

As concluded in the next section, Section 4.18.6, *Environmental Consequences*, implementation of Master Plan Alternatives A, B, and C should not involve building materials that could generate glare which could pose a hazard to aviation. In recognition of this, LAWA has included the following commitments:

- **LI-2. Use of Non-Glare Generating Building Materials.**

  Under, Alternatives A, B, and C, prior to approval of final plans LAWA will ensure that proposed LAX facilities shall be constructed of non-reflective materials and shall not contain undifferentiated expanses of glass.

- **LI-3. Lighting Controls.**

  Prior to final approval of plans for new lighting, LAWA will conduct reviews of lighting type and placement to ensure that lighting will not interfere with aeronautical lights or otherwise impair Airport Traffic Control Tower or pilot operations. Plan review will also ensure, where feasible, that lighting is shielded and focuses to avoid glare or unnecessary light spillover.

The following Master Plan Commitments from other environmental disciplines are also relevant to this analysis:

- **LU-1. Incorporation of City of Los Angeles Ordinance No. 159,526 [Q] Zoning Conditions for LAX Northside into the Westchester Southside Project.**
- **LU-4. Neighborhood Compatibility Program.**

6.0 ENVIRONMENTAL CONSEQUENCES

The proposed LAX Master Plan alternatives and associated changes in lighting sources would have only minor effects on light sensitive land uses adjacent to the airport and within the airport property. Changes to and increases in airport related lighting would primarily occur within current airport boundaries, well away from residential uses in adjacent communities to the north and south. Areas proposed for land acquisition are currently developed and well illuminated and the changes in lighting sources with airport uses under the build alternatives would not result in a significant increase in illumination.

While the build alternatives would result in development of the currently vacant LAX Northside site, the uses and light sources proposed adjacent to existing neighborhoods in this area would be typical of urban areas and sufficiently setback and buffered to preclude adverse lighting impacts. Similarly, along the southern edge of the airport and at the proposed Scattergood Fuel Farm site, areas both visible from residential uses in El Segundo, new light sources would also be sufficiently distant, focused, and buffered to avoid significant impacts. As proposed under Alternative B, the alignment of the ring-road would be in close proximity to eight apartment buildings located on Morley Street with little to no landscaped buffer between these residential uses and proposed roadway facilities that would be well illuminated by street lighting. With acquisition of the warehouse and properties to the south, the lack of a landscaped buffer, and the potential for substantial street lighting in close proximity to these residential uses, it is likely that lighting intensity would increase by more than 2 footcandles. Master Plan Commitment LI-1, Ring Road Landscaping, has been developed by LAWA to address this potential impact and aesthetic concerns. With the implementation of this commitment, impacts from the ring road would be avoided. With the exception of the proposed Scattergood Fuel Farm site and the ring-road under Alternative B, no significant differences in illuminance change was apparent between the three build alternatives. Overall, as demonstrated in **Table 4**, Estimated Lighting Change, there are no estimated occurrences of ambient conditions increasing by two footcandles or more for the referenced residential areas. Based on City of Los Angeles Municipal Code, Section 93.0117 criteria and the thresholds listed above, this level of increase would not significantly effect residences.

Table 4

Estimated Lighting Change
(footcandles, fc)

Receptor[1]	Existing Illuminance[2]	No Action/No Project	Alternative A	Alternative B	Alternative C
A Southern Boundary	0.11 fc	Change = 0	Change = 0.09	Change = 0.09	Change = 0.09
I Scattergood	0.3 fc	Change =0	Change = 0	Change = 0.9	Change = 0
L Northern Boundary	0.03 fc	Change = 0.8	Change = 0.8	Change = 0.8	Change = 0.8
1C Habitat Restoration Area	Change = 0.05 fc	Change = 0	Change = 0.34	Change = 0.34	Change = 0.34

1 Receptors A,I,L, and 1C were concluded to be the potentially worst-impacted locations for the Southern Boundary, Scattergood Power Generating site, Northern Boundary, and Habitat Restoration Area, respectively

2 Illuminance values shown are averages across the horizontal plane (0^o to 180^o).

Source: PCR Services Corporation, 2000

The only significant impact identified applies to each of the build alternatives and is associated with potential impacts on residential uses along the proposed right-of-way for the LAX Expressway. Because final design plans for this project component have not yet been developed, the specific nature and extent of impacts are difficult to determine. Nonetheless, mitigation is provided for this potential effect to ensure there will be no lighting impacts on sensitive receptors. A more comprehensive discussion of impacts and mitigation associated with the LAX Expressway alignment under Alternatives A and C is provided in Appendix K, *Supplemental Environmental Evaluation for LAX Expressway and State Route 1 Improvements*.

The new light sources associated with the West Terminal and parking facilities would increase ambient light levels over those currently found at the west end of the airport. As shown in **Table 4**, Estimated Lighting Change, ambient lighting conditions on the Habitat Restoration Area associated with the West Terminal development are expected to increase by an estimated 0.34 footcandles. Each built alternative would also involve changes to navigational aid lighting associated with changes to the runways. Existing equipment would be relocated as necessary and in some cases additional lighting would be required. **Table 5**, Net Change in Navigational Lighting on the Dunes, shows the net change in navigational lights associated with each built alternative. As shown in **Table 5** there would be a minimal increase in navigational lighting. In addition with Alternative B and C there would be a net decrease in navigational lighting in the Habitat Restoration Area. No addition to security lighting would be expected.

Table 5

Net Change in Navigational Lighting on the Dunes

Alternative	Net Change in Dunes	Net Change in Habitat Restoration Area Only
A	3 additional ALS light standards 7 additional ALSF-2 light standards	2 additional ALS light standards 4 additional ALSF-2 light standards
B	2 less ALS light standards 6 additional ALSF-2 light standards	5 less ALS light standards No additional ALSF-2 light standards
C	3 less ALS light standards 8 additional ALSF-2 light standards	5 less ALS light standards No additional ALSF-2 light standards

Source: PCR Services Corporation, 2000

7.0 CUMULATIVE IMPACTS

As previously discussed under Environmental Consequences, development of the proposed LAX Master Plan alternatives would contribute to increased artificial light emissions. Overall, changes in lighting

sources with airport uses under the build alternatives would not, with a few exceptions, result in an increase in illumination sufficient to create a significant impact on sensitive receptors adjacent to the study area. Potentially significant impacts have been identified with the build alternatives on residential uses located along the proposed right-of-way for the LAX Expressway. Impacts could also occur with Alternative B, where a section of the proposed ring road, and associated lighting would be located in close proximity to residential uses. These impacts would however, be avoided through compliance with regulatory requirements, Master Plan provisions, and mitigation to ensure that lighting intensity does not increase by more than two footcandles over existing levels at the property lines of adjacent residential uses. In considering impacts associated with related project development in the nearby vicinity, the proposed Playa Vista development would be constructed within an area that is currently vacant and would, in combination with the proposed Master Plan, directly increase cumulative ambient lighting conditions north of LAX. However, the combined increase in light emissions associated with these two projects would be ambient in nature and the distance between the sites would not result in cumulatively significant impacts on sensitive receptors. With the projects potential for impacts on sensitive receptors avoided or reduced to less than significant levels through Master Plan design features, regulatory compliance, and Mitigation Measures, and recognition that ambient increases in lighting would occur in the context of infill development within a lit urban environment, cumulative impacts are considered less than significant.

8.0 MITIGATION MEASURES

A potential significant lighting impact associated with the LAX Expressway was identified under each of the three build alternatives. No other significant lighting impacts were identified for any of the build alternatives.

No Action/No Project Alternative

No mitigation required, impacts less than significant.

Alternatives A, B, and C

- **MM-LI-1. LAX Expressway Lighting Assessment.**

  As part of final design for the LAX Expressway LAWA shall undertake an assessment of potential adverse lighting effects based on detailed plans. The documentation shall include baseline ambient lighting measurements along the portions of the LAX Expressway adjacent to sensitive uses. The baseline data shall be used to estimate potential change in ambient lighting conditions with development of the Expressway. If it is determined that adverse effects would occur on residential uses, then landscaped buffer areas, setbacks, lighting specifications and placement, or other techniques shall be required to ensure that lighting intensity over baseline conditions for residential uses does not increase by more than 2 footcandles.

9.0 LEVEL OF SIGNIFICANCE AFTER MITIGATION

With implementation of mitigation measure MM-LI-1, lighting impacts to sensitive receptors would be reduced to less-than-significant levels.

Attachment A
Field Survey Data Sheets

U.S. Naval Observatory
Astronomical Applications Department

Sun and Moon Data for One Day

The following information is provided for Los Angeles, Los Angeles County, California (longitude W118.4, latitude N34.1):

Wednesday
5 January 2000 Pacific Standard Time

SUN	
Begin civil twilight	6:32 a.m.
Sunrise	7:00 a.m.
Sun transit	11:59 a.m.
Sunset	4:58 p.m.
End civil twilight	5:26 p.m.
MOON	
Moonset	3:38 p.m. on preceding day
Moonrise	6:03 a.m.
Moon transit	11:13 a.m.
Moonset	4:23 p.m.
Moonrise	6:52 a.m. on following day

Phase of the Moon on 5 January: waning crescent with 1% of the Moon's visible disk illuminated.

New Moon on 6 January 2000 at 10:13 a.m. Pacific Standard Time.

Census Bureau map of Los Angeles area

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	**Date:** 1/5/00
Location: DUNES 1-a (TRANSECT 1, JUST S/O A/P &)	**Time:** 1900
10' Inside of Fence @ Pershing by small pump n 100yds s/o Center St.	**Sunset:** 16:58
GPS: Lat: 33 ° 56 · 18 " Long: 118 ° 25 · 55 "	**Civil Twilight:** 17:26
Viewshed: A/P, WEST END	**Engr(s):** RAM/RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head **S/N:** B022200

Weather: 61.1 °F <20 %RH 0-2, / Wind Speed/Dir

Sky: ☒ Clear ☐ Foggy ☐ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy

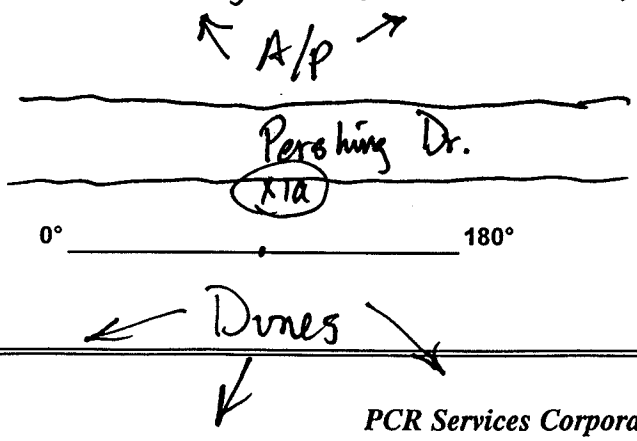
Moon: ☒ Waning, 14 days past Full ☐ Waxing, ___ days past New /% disk illum'd

Moonrise: 0652 (1/6/00) **Moonset:** 1623 (1/5/00) **Moon Visible (y/n):** N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	0.174	.183	0.134
viewing	Hill	Sky & Pershing St. lights	sand
30°	0.203	.200	0.155
viewing	Pershing Dr.	Sky & Pershing St. lights	sand
60°	0.204	0.232	0.137
viewing	A/P	Sky & Pershing St. lights	curb
90°	0.225	0.253	0.148
viewing	A/P	Sky over A/P	curb
120°	0.230	0.255	0.164
viewing	A/P	sky & Pershing St. lights	sand
150°	0.233	0.240	0.164
viewing	Pershing Dr.	Sky & St. lights	Sand
180°	0.182	0.200	0.122
viewing	Pershing St. lights	Pershing St. lights	Sand

NOTES:



Rev. 1

PCR Services Corporation

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	Date: 1/5/00
Location: Dunes 1b (Transect 1)	Time: 1919
1/2-way up hill straight west of Dunes 1a	Sunset: 16:58
GPS: Lat: ____° ____' ____" Long: ____° ____' ____"	Civil Twilight: 17:26
Viewshed: A/P	Engr(s): Ram/RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head **S/N:** B022200

Weather: 61 °F ____ %RH 0 / — Wind Speed/Dir

Sky: ☒ Clear ☐ Foggy ☐ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy

Moon: ☒ Waning, 14 days past Full ☐ Waxing, ____ days past New 1 % disk illum'd

Moonrise: 0652 (1/6/00) Moonset: 1623 (1/5/00) Moon Visible (y/n): N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	0.064	0.057	0.049
viewing	hill	Sky over hillside	Vegetation & sand
30°	0.099	0.087	0.076
viewing	Pershing & Center Interchange	Sky over interchange	veg'n & Sand
60°	0.122	0.110	0.097
viewing	Batch Plant	Sky over Batch Plant	veg'n & sand
90°	0.199	0.110	0.097
viewing	A/P & Tower	Sky over Tower	veg'n & sand
120°	0.100	0.093	0.074
viewing	A/P & Vacant land	Sky over R/W	veg'n & sand
150°	0.065	0.065	0.050
viewing	Vacant land & El Seg.	Sky over vacant land	veg'n & sand
180°	.034	0.034	0.029
viewing	Side of downslope	Sky above dunes	Veg'n & Sand

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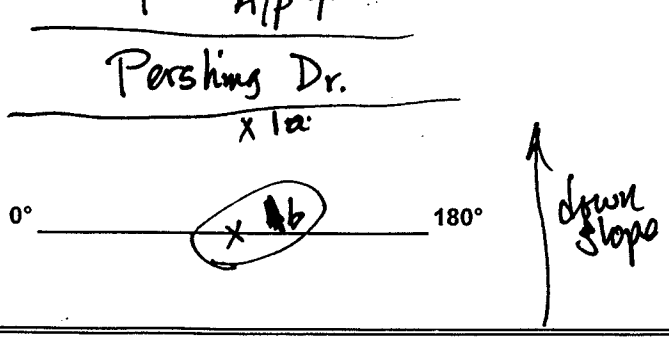

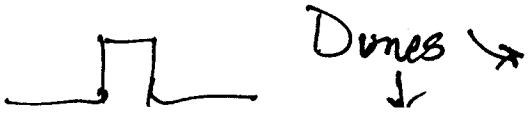

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN		Date: 1/5/00
Location: Dunes C (Transect 1) Crest of hill		Time: 1930
		Sunset: 16:58
GPS: Lat: 33 ° 56 · 47 "	Long: 118 ° 26 · 00 "	Civil Twilight: 17:26
Viewshed: A/P & dunes to sides — lots of pt. lights		Engr(s): Ram/RCW

at end of sandy road

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: 61 °F ____ %RH 0 / — Wind Speed/Dir

Sky: ☒ Clear ☐ Foggy ☐ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy

Moon: ☒ Waning, 14 days past Full ☐ Waxing, ____ days past New 1 % disk illum'd

Moonrise: 0652 (1/6/00) Moonset: 1623 (1/5/00) Moon Visible (y/n): N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	0.026	0.026	0.024
viewing	Veg'n & sky	Sky over dunes	Veg'n & sand
30°	0.053	0.048	0.048
viewing	Interchange	Sky over interchange	veg'n & sand
60°	0.074	0.068	0.065
viewing	Interchange	Sky over interchange	Veg'n & sand
90°	0.079	0.071	0.067
viewing	Batch Plant	Sky over batch plant	veg'n, sand, & Pershing
120°	0.064	0.058	0.055
viewing	Center of A/P	sky over A/P	veg'n & Sand
150°	0.040	0.036	0.030
viewing	Vacant A/P area	Sky over E.S.	Veg'n & sand
180°	0.010	0.019	0.014
viewing	dunes & veg'n	Sky over dunes	veg'n & sand

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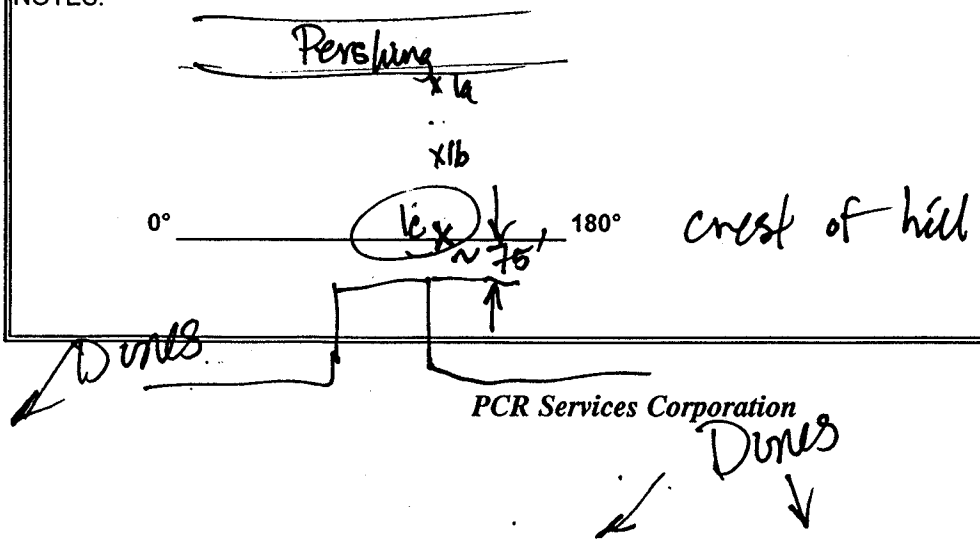

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ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN		**Date:** 1/5/00
Location: Dines Rd (Transect 1) Middle of Intersection (see map)		**Time:** 1939
		Sunset: 16:58
GPS: Lat: 33 ° 56 · 16 "	**Long:** 118 ° 26 · 02 "	**Civil Twilight:** 17:26
Viewshed: Crest of hill w/ top of A/P structures beyond		**Engr(s):** Ram/RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head **S/N:** B022200

Weather: 61.7 °F 57 %RH 01 Wind Speed/Dir

Sky: ☒ Clear ☐ Foggy ☐ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy

Moon: ☒ Waning, 14 days past Full ☐ Waxing, ___ days past New 1 % disk illum'd

Moonrise: 0652 (1/6/00) **Moonset:** 1623 (1/5/00) **Moon Visible (y/n):** N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	0.005	~~0.007~~ 0.006	0.004
viewing	Road	sky	street
30°	0.008	~~0.010~~ 0.008	0.006
viewing	Sand dune	sky	street
60°	0.010	~~0.011~~ 0.010	0.008
viewing	Sand dune	Sky over A/P	street
90°	0.011	0.010	0.008
viewing	top of A/P	Sky over A/P	Street
120°	0.010	~~0.010~~ 0.011	0.008
viewing	top of A/P	sky	street
150°	0.009	~~0.008~~ 0.010	0.007
viewing	Sand dune	sky	street
180°	0.006	~~0.006~~ 0.007	0.004
viewing	road	Sky over road	street

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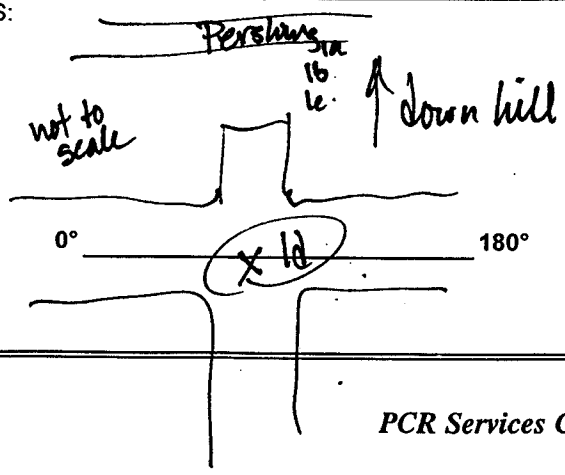

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	**Date:** 1/5/00
Location: Dunes Transect 1 Extension (down road toward ocean to dunement drop-off on downhill side)	**Time:** 2000
	Sunset: 16:58
GPS: Lat: 33 · 56 · 16 " Long: 118 · 26 · 05 "	**Civil Twilight:** 17:26
Viewshed: Roadway & dunes to side (w/ decreasing glow from A/P)	**Engr(s):** RKM/RCW
Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head	**S/N:** B022200
Weather: 60.1 °F 57 %RH 0 / — Wind Speed/Dir	
Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy	
Moon: ☒ Waning, 14 days past Full ☐ Waxing, ___ days past New / % disk illum'd	
Moonrise: 0652 (1/6/00) **Moonset:** 1623 (1/5/00) **Moon Visible (y/n):** N	

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. ~~(looking up)~~	Horiz. ~~(looking down)~~
0° viewing	all Horiz. looking toward A/P		
30° viewing	Dunes le	Dunes lf	Dunes lg
60° viewing	0.010 dunes & sky over A/P	0.010 road, dunes, & glow over A/P	0.008 Sand dune
90° viewing	0.011 sand & sky over A/P	0.009 above	0.008 road & faint glow from A/P
120° viewing	0.009 dunes & sky over A/P	0.008 ~~dune~~ crest of hill	0.007 Sand dune
150° viewing			
180° viewing			

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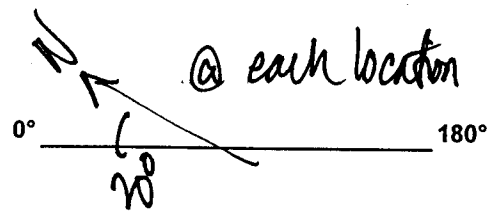

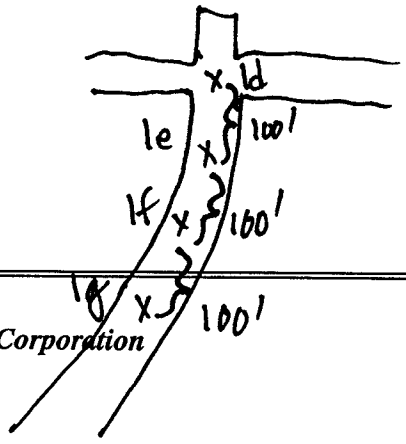

Rev. 1

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN 33 56 03 118 25 47		**Date:** 1/5/00
Location: Dunes 2a		**Time:** 2045
Bottom of hill close to Pershing @ corner of drainage channel		**Sunset:** 16:58
GPS: Lat: by fenceline (closest habitat area to A/P "on this transect)		**Civil Twilight:** 17:26
Viewshed: Bermed area of A/P property		**Engr(s):** RAM/RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head **S/N:** B022200

Weather: 59 °F ____ %RH 01 — Wind Speed/Dir

Sky: ☒ Clear ☐ Foggy ☐ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy

Moon: ☒ Waning, 14 days past Full ☐ Waxing, ____ days past New 1 % disk illum'd

Moonrise: 0652 (1/6/00) **Moonset:** 1623 (1/5/00) **Moon Visible (y/n):** N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0° viewing	0.032 d hillside	0.032 hillside	0.019 veg'n & sand
30° viewing	0.041 Pershing	0.046 sky over batch plant	0.032 veg'n & sand
60° viewing	0.051 Pershing	0.054 sky over Admin Bldg.	0.036 drainage basin
90° viewing	0.052 Pershing	0.055 sky over Rwy	0.036 drainage basin
120° viewing	0.041 Pershing	0.046 sky over Rwy	0.028 drainage basin
150° viewing	0.031 Pershing	0.033 sky over E.S.	0.022 drainage basin
180° viewing	0.018 tree & dunes	0.021 S. sky	0.013 veg'n & sand

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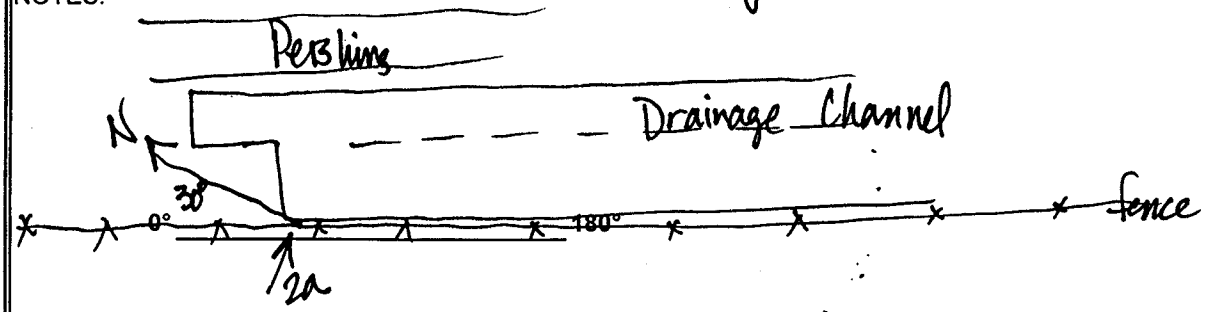


Rev. 1

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	Date: 1/5/00
Location: Dunes 2b (Transect 2)	Time: 2032
Mid-way up hill from Pershing	Sunset: 16:58
GPS: Lat: ___ ° ___ ' ___ " Long: ___ ° ___ ' ___ "	Civil Twilight: 17:26
Viewshed: A/P to front & dunes to sides	Engr(s): RAM/RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: 59 °F ___ %RH 01 Wind Speed/Dir

Sky: ☒ Clear ☐ Foggy ☐ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy

Moon: ☒ Waning, 14 days past Full ☐ Waxing, ___ days past New 1 % disk illum'd

Moonrise: 0652 (1/6/00) Moonset: 1623 (1/5/00) Moon Visible (y/n): N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0° viewing	0.010 hillside	0.011 hillside	0.008 veg'n & sand
30° viewing	0.022 A/P	0.025 tree	0.020 veg'n & sand
60° viewing	.037 Admin Bldg	0.036 sky	0.030 veg'n & sand
90° viewing	0.045 S. Rwy	0.042 sky over S. Rwy	0.035 Veg'n & sand
120° viewing	0.039 S. Rwy	0.040 Sky over E.S.	0.032 Veg'n & sand
150° viewing	0.029 El Segundo	0.032 Sky over E.S.	0.022 veg'n & sand
180° viewing	0.016 hillside	0.017 sky over dunes	0.012 Veg'n & sand

NOTES:

Pershing

↑ Down hill

0° 30° ↑ 2b 180° — mid point of slope

2c crest

NW Arid

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	Date: 1/5/00
Location: Dunes 2c (Transect 2) & 2 S. Rwys	Time: 2017
Crest of hill ~150' east of Nav Aid Facility	Sunset: 16:58
GPS: Lat: 33 · 56 · 01 " Long: 118 · 25 · 52 " (by Nav Aid Bldg)	Civil Twilight: 17:26
Viewshed: Overlooking A/P toward SW Corner	Engr(s): RAM/RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: 58 °F ~65 %RH 0 / — Wind Speed/Dir

Sky: [X] Clear [ ] Foggy [ ] Cloudy/Overcast [ ] Partly Cloudy [ ] Hazy/Smoggy

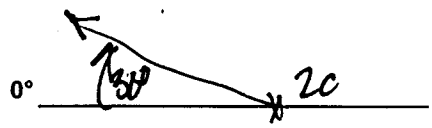
Moon: [X] Waning, 14 days past Full [ ] Waxing, ___ days past New 1 % disk illum'd

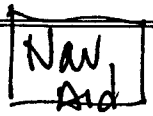
Moonrise: 0652 (1/6/00) Moonset: 1623 (1/5/00) Moon Visible (y/n): N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0° viewing	0.030 hillside	0.032 sky over dunes	0.021 veg'n
30° viewing	0.048 Batch Plant	0.048 sky over Batch Plant	0.035 veg'n
60° viewing	0.058 looking toward Admin West	0.056 sky over Admin Bldg	0.042 veg'n
90° viewing	0.056 S. Rwy	0.055 sky over S. Rwy	0.040 downhill
120° viewing	0.044 Vacant A/P & E.S.	0.044 sky over A/P land	0.021 veg'n
150° viewing	0.028 over El Segundo	0.031 sky over E.S.	0.018 veg'n
180° viewing	0.015 Pershing & Dunes	0.016 sky to South	0.011 veg'n

NOTES: Pershing





Rev. 1

PCR Services Corporation

Dunes Dunes

ILLUMINANCE SURVEY

Field Data Sheet

SAMPLE SITES 1

Project: LAX MASTER PLAN	Date: 1/5/00
Location: VARIOUS – AS NOTED	Time: ~2100+
Sample of representative sources to overlay on existg contours	Sunset: 16:58
GPS: Lat: ___ ° ___ ' ___ " Long: ___ ° ___ ' ___ "	Civil Twilight: 17:26
Viewshed: AS NOTED	Engr(s): RAM/RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: ~58 °F ~65 %RH 01 Wind Speed/Dir

Sky: ☒ Clear ☐ Foggy ☐ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy

Moon: ☒ Waning, 14 days past Full ☐ Waxing, ___ days past New 1 % disk illum'd

Moonrise: 0652 (1/6/00) Moonset: 1623 (1/5/00) Moon Visible (y/n): N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

(looking toward sources)	Horizontal (looking out)	[redacted]	[redacted]
viewing (A)	0.279 Car Rental yard @ 700'	Around 9301 93rd St. off Airport Blvd. across from ⊥ to Axis of Nat'l Rents	
viewing (B)	0.036–0.046 Car Rental yard @ 350'	ditto above, but close to rental yards (still on 93rd St.)	
viewing (C)	0.185 (Sodium vapor lighting) Parking lot / Parking structure @ 300'	Near Westchester's Nielsen Park (corner of Wiley Post & Airlane)	
viewing (D)	0.44 Parking lot / Parking structure @ 100'	Near corner of Croydon & Wiley Post (across street from park'g lot)	
viewing (E)	1.20 Parking lot @ 100' (avg of entire lot)	Near Kittyhawk & Wiley Post Lmax. lot illumination example	
viewing (F)	0.35–0.80 R&D/Business Park (Parking lot)	TRW Facilities on Marine Ave in Redondo Bch (w/o Aviation)	
viewing (G)	0.12 R&D/Business Park (Parking lot)	TRW Facilities on Marine Ave w/o Redondo Beach Ave in Red. Bch	

NOTES:

(H) 0.45–0.54 R&D/Business Park (storage/work yard) — ditto above on Redondo Beach Ave.

(I) 0.65–0.78 R&D/Business Park (rear of bldg (equip., receiving, large access doors)) — ditto above on Redondo Beach Ave.

0° 180°

Rev. 1

ILLUMINANCE SURVEY

Field Data Sheet

SAMPLE SITES 2

Project: LAX MASTER PLAN	**Date:** 1/5/00
Location: first page of Sample Sites	**Time:**
	Sunset: 16:58
GPS: Lat: See Long: ° ' "	**Civil Twilight:** 17:26
Viewshed:	**Engr(s):** RSM/RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head **S/N:** B022200

Weather: ~50 °F ~65 %RH 0 1 — Wind Speed/Dir

Sky: ☒ Clear ☐ Foggy ☐ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy

Moon: ☒ Waning, 14 days past Full ☐ Waxing, ___ days past New ~1 % disk illum'd

Moonrise: 0652 (1/6/00) **Moonset:** 1623 (1/5/00) **Moon Visible (y/n):** N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

Looking toward AIRCRAFT SOURCE(S)	Horizontal (looking out)	[redacted]	[redacted]
viewing	(I) 6.4 – 7.0 Commercial (Hotel, office, Retail) – bright!		Ralph's shopping Center (roughly a U-shaped complex
viewing	(K) 5.7 @ 100' ⊥ from side/back areas Commercial (Hotel, office, retail) – bright!		Ralph's Center behind & side access/parking area
viewing	(L) 0.68 – 0.83 Comm'l (Hotel, office, retail) – more managed lighting		Mervyn's Shopping Center (avg.)
viewing	(M) 1.0 @ 50' Rec'l (Golf Range or Tennis Courts)		Westchester Golf/Tennis Recreational Center – 50' from tennis courts
viewing	(N) 0.077 Longitudinal A/P Terminal @ 3000'		Looking @ O.C. SNA from top level of Parking Structure @ Irvine Health Club
viewing	(O) 0.32 – 0.39 Longitudinal A/P Terminal w/ parking @ 750'		Looking @ O.C. SNA, ⊥ to terminal on Business Center Drive
viewing	(P) —		

NOTES:

Berms – Use ambient data from 88th St. (by berms/walls)
Cargo Facilities – Use ambient data from East end of Imperial Ave. which are across from existing Cargo Bldgs.

0° _____ 180°

Rev. 1

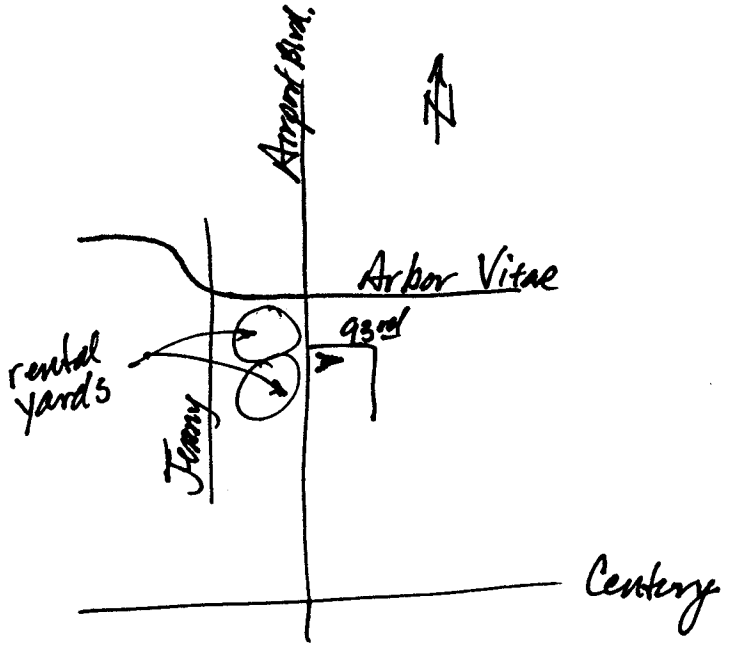
ILLUMINANCE SURVEY

Field Data Sheet

SAMPLE SITES 3

Project: LAX MASTER PLAN	Date: 1/5/00
Location: REPRESENTATIVE SOURCES – LOCATION DIAGS	Time:
	Sunset: 16:58
GPS: Lat: ___ Long: ___	Civil Twilight: 17:26
Viewshed: AS NOTED	Engr(s): RAM/RCW

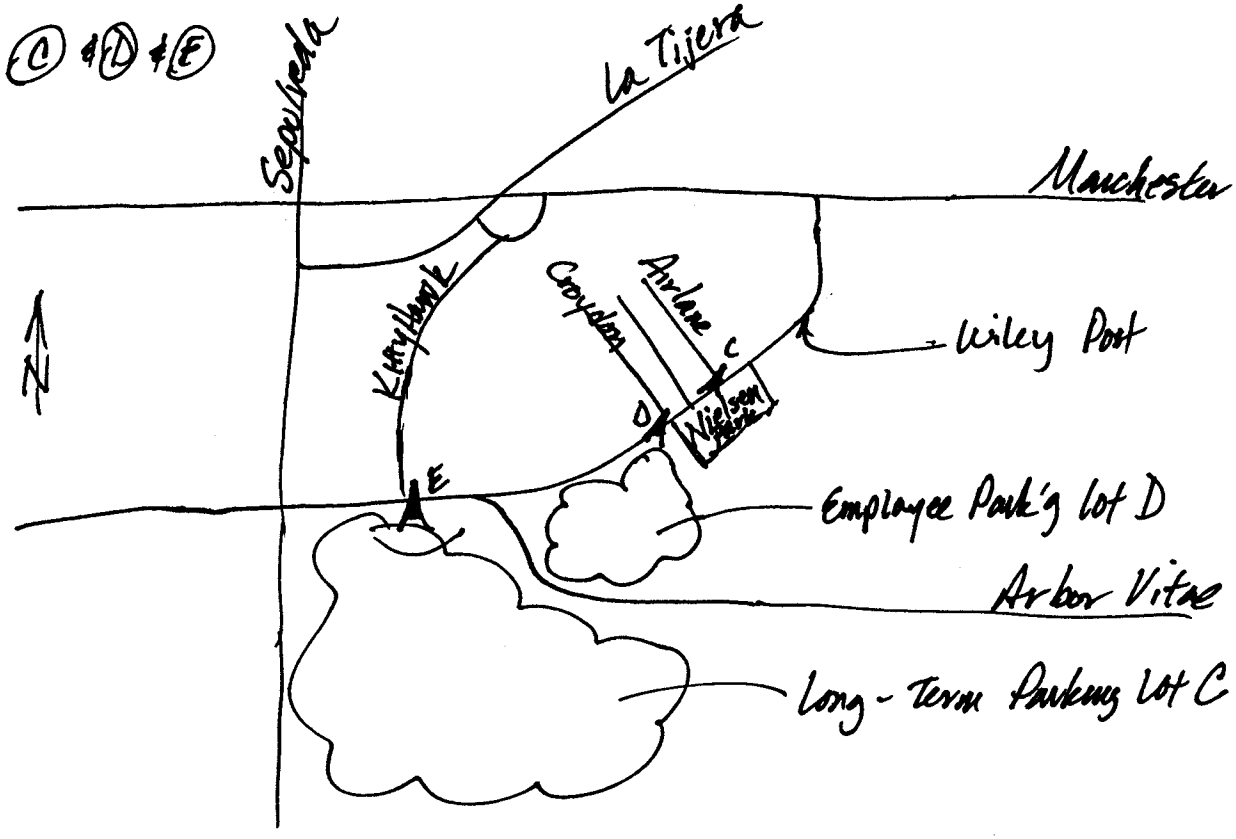
(A) & (B)



= viewing direction (horizontal)

= viewing direction scanning viewshed for range of illuminance values

(C) & (D) & (E)



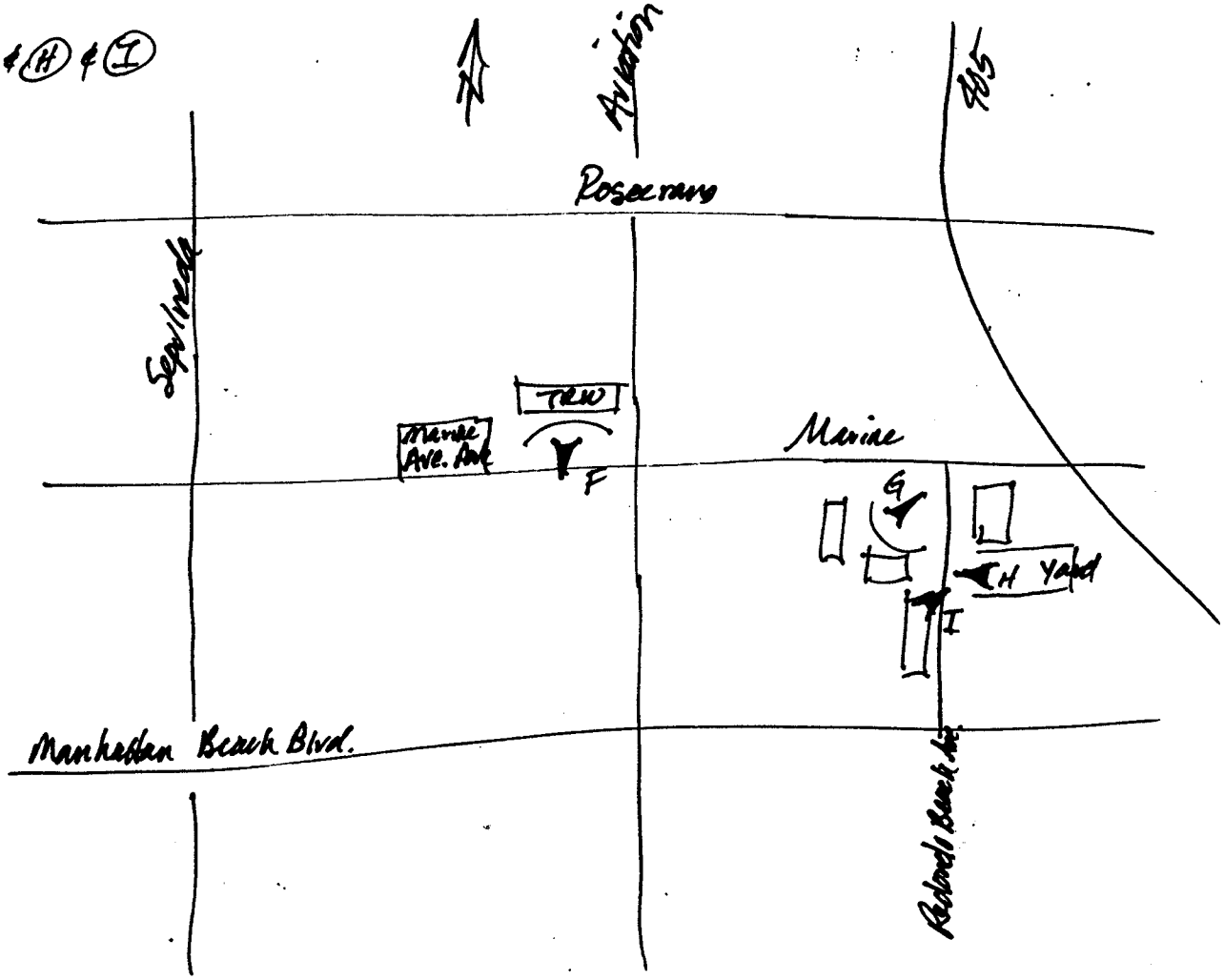
ILLUMINANCE SURVEY

Field Data Sheet

SAMPLE SITES 4

Project: LAX MASTER PLAN	Date: 1/5/00
Location: REPRESENTATIVE SOURCES – LOCATION DWGS	Time:
	Sunset: 16:58
GPS: Lat: ___° ___' ___" Long: ___° ___' ___"	Civil Twilight: 17:26
Viewshed: AS NOTED	Engr(s): RAM/RCW

(F) & (G) & (H) & (I)

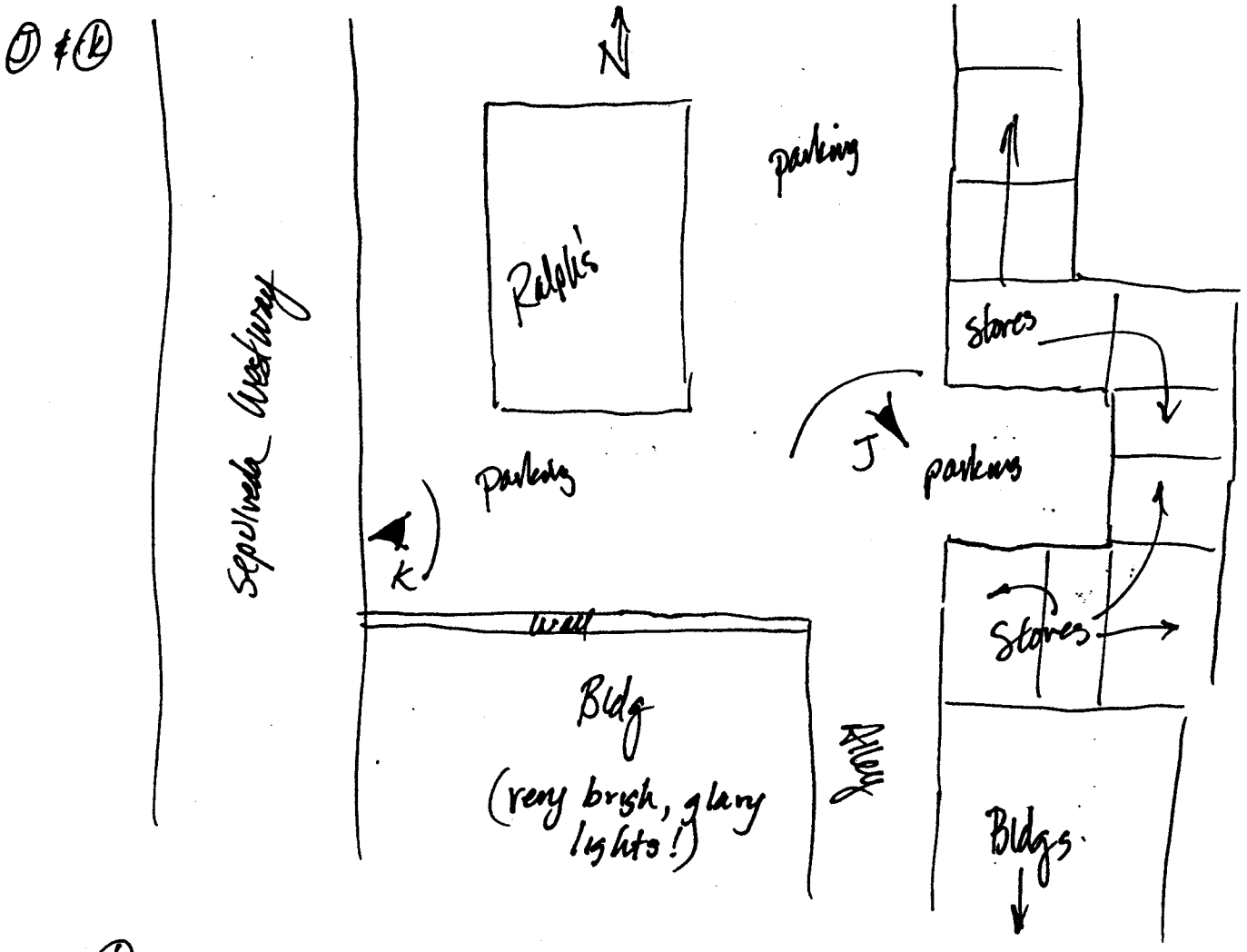


ILLUMINANCE SURVEY

Field Data Sheet

SAMPLE SITES 5

Project: LAX MASTER PLAN	**Date:** 1/5/00
Location: REPRESENTATIVE SOURCES – LOCATION DIAGS	**Time:**
	Sunset: 16:58
GPS: Lat: ___° ___' ___" Long: ___° ___' ___"	**Civil Twilight:** 17:26
Viewshed: AS NOTED	**Engr(s):** RAM/RCW



(much more shielded fixtures to only illuminate lot & cars)

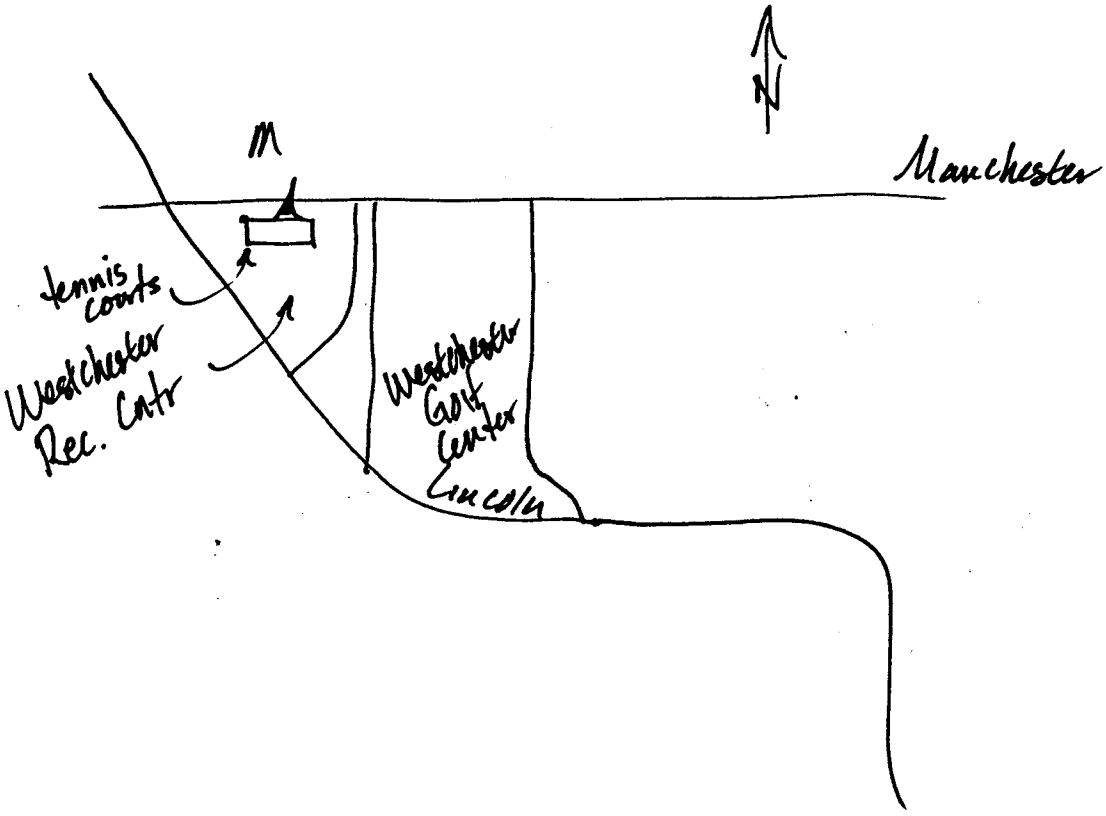
ILLUMINANCE SURVEY

Field Data Sheet

SAMPLE SITES 6

Project: LAX MASTER PLAN	Date: 1/5/00
Location: REPRESENTATIVE SOURCES – LOCATION DWGS	Time:
	Sunset: 16:58
GPS: Lat: ___° ___' ___" Long: ___° ___' ___"	Civil Twilight: 17:26
Viewshed: AS NOTED	Engr(s): RAM/RCW

(M)



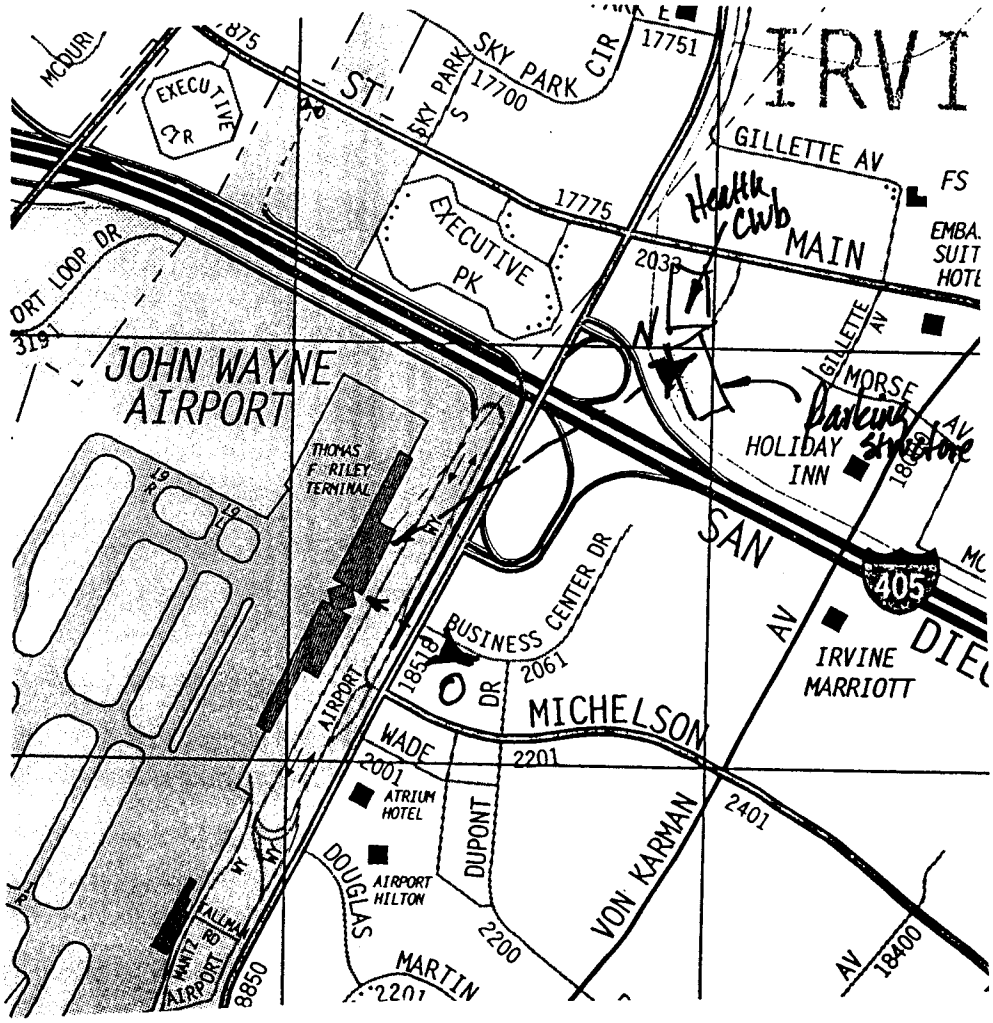
ILLUMINANCE SURVEY

Field Data Sheet

Sample Sites 7

Project: LAX MASTER PLAN	**Date:** 1/5/00
Location: Representative Sources – Location Drugs	**Time:**
	Sunset: 16:58
GPS: Lat: ___ Long: ___	**Civil Twilight:** 17:26
Viewshed: As Noted	**Engr(s):** RAM/RCW

(N 40)



N is seen as very representative of what E. Imperial Ave. residence will view with new LAX west Terminal [Distance and angle and height differential]

U.S. Naval Observatory
Astronomical Applications Department

Sun and Moon Data for One Day

The following information is provided for Los Angeles, Los Angeles County, California (longitude W118.4, latitude N34.1):

Thursday
30 December 1999 Pacific Standard Time

SUN	
Begin civil twilight	6:31 a.m.
Sunrise	6:59 a.m.
Sun transit	11:56 a.m.
Sunset	4:53 p.m.
End civil twilight	5:21 p.m.

MOON	
Moonset	12:09 p.m. on preceding day
Moonrise	12:37 a.m.
Moon transit	6:42 a.m.
Moonset	12:40 p.m.
Moonrise	1:33 a.m. on following day

Phase of the Moon on 30 December: waning crescent with 38% of the Moon's visible disk illuminated.

Last quarter Moon on 29 December 1999 at 6:05 a.m. Pacific Standard Time.

Census Bureau map of Los Angeles area

ILLUMINANCE SURVEY

@

Field Data Sheet

Project: LAX MASTER PLAN	Date: 12/30/1999
Location: H Far West End of Franklin Ave. @ access gate to Scattergood Tank Farm	Time: 1815
	Sunset: 16:53
GPS: Lat: 33 ° 55 · 05 " Long: 118 ° 25 · 16 "	Civil Twilight: 17:21
Viewshed: Hillside w/ trees obscuring tank farm	Engr(s): RAM / RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: 57.2 °F 73 %RH 0 / — Wind Speed/Dir

Sky: ☐ Clear ☐ Foggy ☒ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy

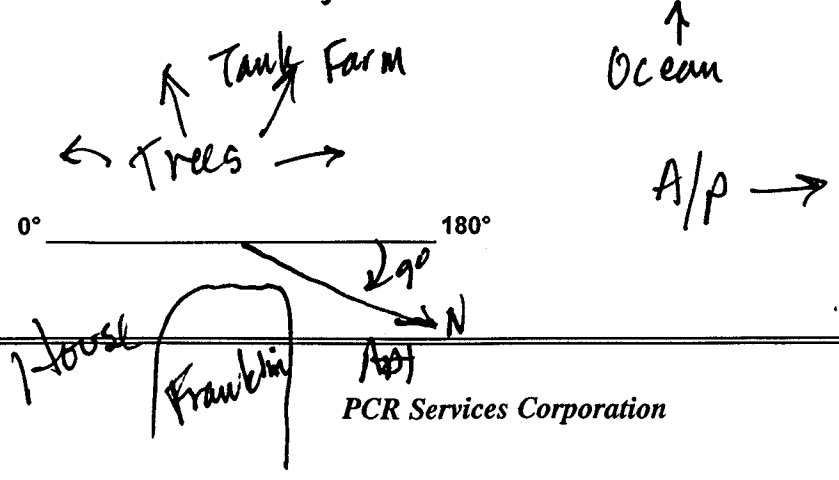
Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New 38 % disk illum'd

Moonrise: 01:33 (12/31) Moonset: (12/30) 12:40 Moon Visible (y/n): Y

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	0.022	0.032	0.016
viewing	edge of house & shrubs	trees &	street
30°	0.011	0.019	0.005
viewing	trees	trees & sky	street & dirt
60°	0.007	0.012	0.004
viewing	trees	trees & sky	dirt
90°	0.007	0.013	0.006
viewing	trees	trees & sky	dirt
120°	0.011	0.015	0.007
viewing	trees	trees	dirt
150°	.015	0.022	0.010
viewing	trees	sky	street & dirt
180°	0.019	0.028	0.011
viewing	edge of Apt. Bldg	tree, edge of Apt., St. light	Street

NOTES:



ILLUMINANCE SURVEY

Field Data Sheet

Project:	LAX MASTER PLAN	**Date:**	12/30/1999
Location:	Corner of Loma Vista St. & Binder Pl.	**Time:**	1830
	I	**Sunset:**	16:53
GPS:	Lat: 33 ° 54 · 56 " Long: 118 ° 25 · 13 "	**Civil Twilight:**	17:21
Viewshed:	Back end of Tank farm hillside & Apt. Bldg.	**Engr(s):**	RAM / RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head **S/N:** B022200

Weather: 56.4 °F 77 %RH 0-5 / W Wind Speed/Dir

Sky: ☐ Clear ☐ Foggy ☒ Cloudy/Overcast ☐ Partly Cloudy ☐ Hazy/Smoggy

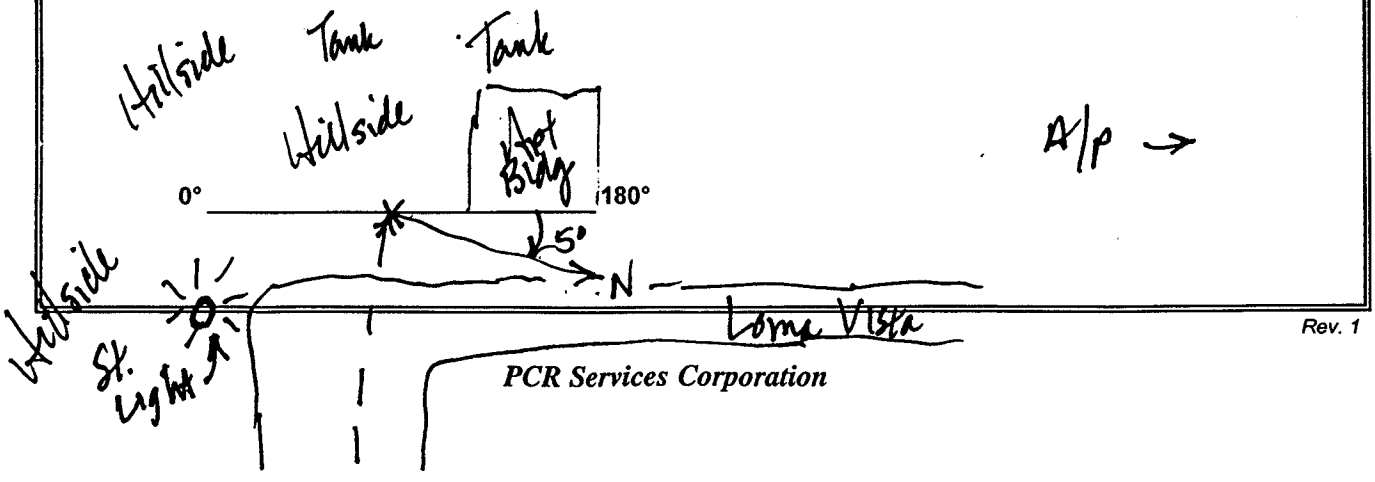
Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New 38 % disk illum'd

Moonrise: 01:33 (12/31) **Moonset:** 12:40 **Moon Visible (y/n):** N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	0.88	1.366	0.286
viewing	Hillside	Sky & St. Light	dirt
30°	0.349	0.879	0.090
viewing	Hillside	Sky & St. Light	vegetation
60°	0.097	0.400	0.117
viewing	Hillside	Sky, hillside, St. light	vegetation
90°	0.172	0.157	0.182
viewing	Hillside	Sky	vegetation
120°	0.236	0.200	0.233
viewing	Apt. Bldg w/ lights	Apt. Bldg	vegetation
150°	0.249	0.210	0.257
viewing	Apt. Bldg.	Apt. Bldg.	vegetation & wall
180°	0.208	0.205	0.239
viewing	length of St. & distant St. light	sky along street	side walk

NOTES:



ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	Date: 12/30/1999
Location: SE Corner of Napoleon St & Ridge Ave. (between two locked gates on sidewalk)	Time: 1946
	Sunset: 16:53
GPS: Lat: 33 · 57 · 06 " Long: 118 · 26 · 36 "	Civil Twilight: 17:21
Viewshed: Slight rise in vacant area N of Sandpiper	Engr(s): RAM / RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: 53.6 °F 85 %RH 0-5 / W Wind Speed/Dir

Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☒ Partly Cloudy ☐ Hazy/Smoggy

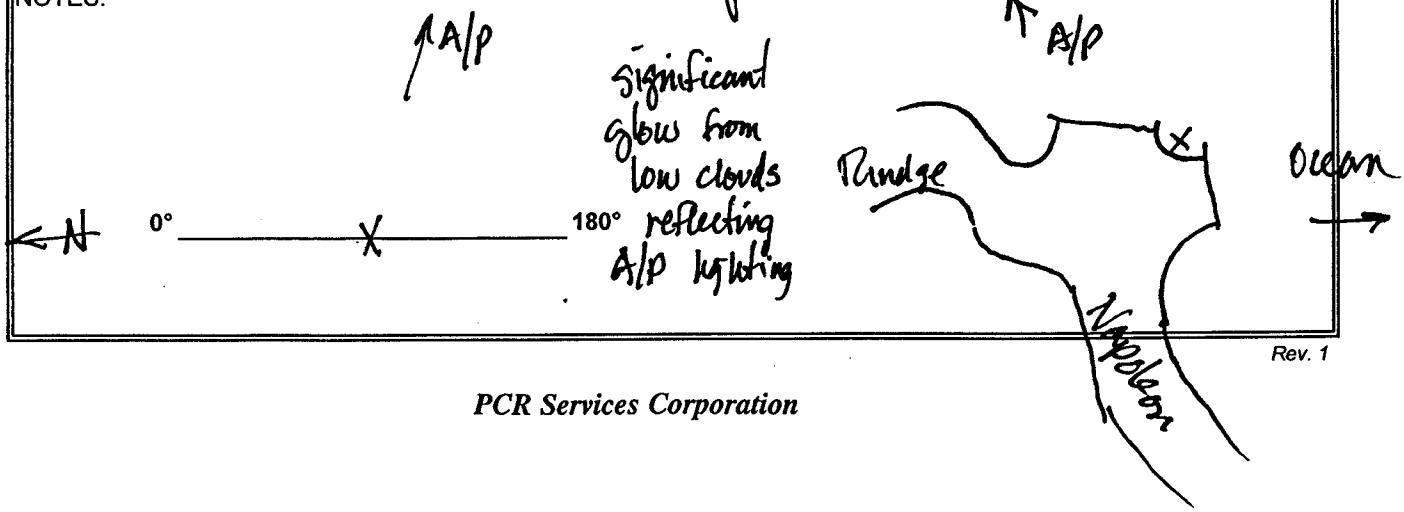
Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New 38 % disk illum'd

Moonrise: 01:33 (12/31) Moonset: 12:40 Moon Visible (y/n): N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0° viewing	0.046 street lamp & houses	0.045 sky & st. light	0.038 street
30° viewing	0.037 vacant lot	0.036 sky	0.029 street
60° viewing	0.023 vacant lot (Sandpiper N)	0.023 sky	0.017 sidewalk
90° viewing	0.016 vacant area toward A/P	0.015 sky toward A/P	0.013 dirt
120° viewing	0.014 vacant lot	0.014 sky	0.011 dirt
150° viewing	0.011 vacant lot	0.011 sky	0.009 dirt & sidewalk
180° viewing	0.007 vacant lot (towards ocean)	0.008 sky	.006 sidewalk

NOTES:



Rev. 1

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	Date: 12/30/1999
Location: In Front of 255 Waterview on Sidewalk (residential side) opposite side is vacant lot	Time: 2005
K	Sunset: 16:53
GPS: Lat: 33 · 57 · 08 " Long: 118 · 26 · 33 "	Civil Twilight: 17:21
Viewshed: 1/2 Distant A/P & 1/2 Vacant area by Sandpiper	Engr(s): RAM / RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: 55/76F 82 %RH 0-7, W Wind Speed/Dir

Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☒ Partly Cloudy ☐ Hazy/Smoggy

Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New 38 % disk illum'd

Moonrise: 01:33 (12/31) Moonset: 12:40 Moon Visible (y/n): N

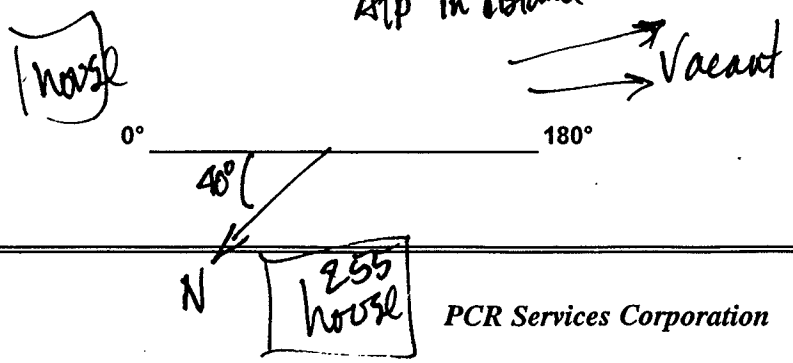
ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	~~0.251~~ 0.022	0.029	0.017
viewing	hillside up to house	house	vegetation
30°	~~0.336~~ 0.031	0.037	0.025
viewing	houses & st. lights	sky & A/P(E)	sidewalk
60°	0.034	0.039	0.027
viewing	Airport in distance	sky over A/P	curb
90°	0.029	0.034	0.022
viewing	Airport in distance	sky over A/P(W)	street
120°	0.019	0.025	0.015
viewing	Sandpiper vacant lot	sky	street
150°	0.016	0.019	0.012
viewing	Sandpiper vacant lot	sky	street
180°	0.016	0.018	0.012
viewing	vacant lot & over ocean	sky	street

NOTES:

↑ ↑ ↑ A/P in distance

Some glow/glare from clouds



Rev. 1

PCR Services Corporation

ILLUMINANCE SURVEY

Field Data Sheet

Project:	LAX MASTER PLAN	**Date:**	12/30/1999
Location:	On Falmouth on west side of street across from H.S. Field @ S. end of Apt. Complex (by fence corner)	**Time:**	2030
		Sunset:	16:53
GPS:	Lat: 33 ° 57 · 16 " Long: 118 ° 26 · 00 "	**Civil Twilight:**	17:21
Viewshed:	Vacant lot w/ A/P in distance to high school prop.	**Engr(s):**	RAM / RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head **S/N:** B022200

Weather: 56.7 °F 71 %RH 01 — Wind Speed/Dir

Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☒ Partly Cloudy ☐ Hazy/Smoggy

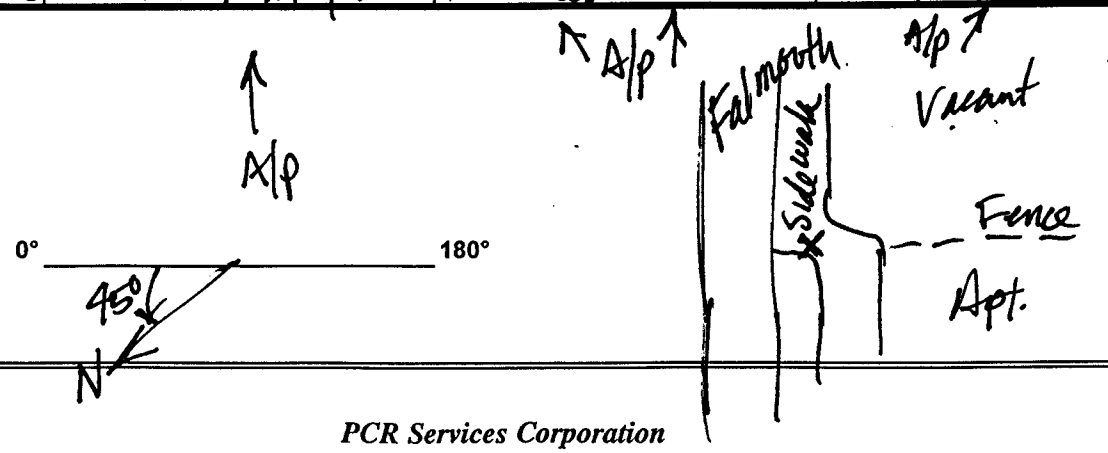
Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New 38 % disk illum'd

Moonrise: 01:33 (12/31) **Moonset:** 12:40 **Moon Visible (y/n):** N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0° viewing	0.025 H.S. Field Shrubs	0.029 Sky & St. lights	0.022 curb
30° viewing	0.034 H.S. Lights	0.035 Sky	0.029 sidewalk
60° viewing	0.038 H.S. Shrubs	0.038 Sky & St lights	0.031 sidewalk
90° viewing	0.033 St. lights & A/P lights	0.035 Sky	0.031 sidewalk
120° viewing	0.029 Vacant lot & A/P lights	0.029 Sky	0.027 dirt
150° viewing	0.024 Vacant lot & A/P lights	0.024 Sky	0.024 dirt
180° viewing	0.027 Vacant lot & trees	0.024 trees	0.029 sidewalk

NOTES:



Rev. 1

PCR Services Corporation

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	Date: 12/30/1999
Location: South end of Rayford St. on East side of street	Time: 2051
My house	Sunset: 16:53
GPS: Lat: 33 · 57 · 15 " Long: 118 · 25 · 19 "	Civil Twilight: 17:21
Viewshed: Vacant area to A/P to vacant area (E→S→W)	Engr(s): RAM / RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: 55.4 °F 74 %RH 0 / — Wind Speed/Dir

Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☒ Partly Cloudy ☐ Hazy/Smoggy

Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New 38 % disk illum'd

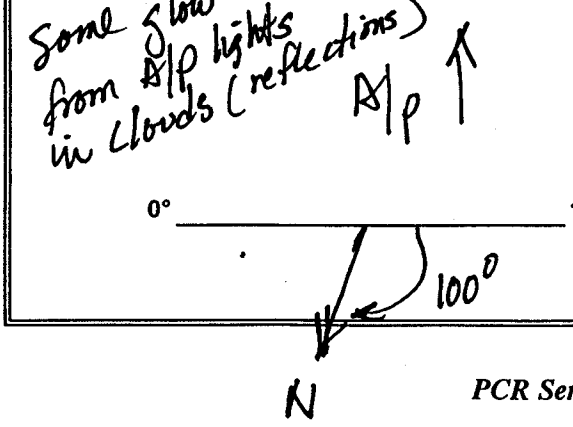
Moonrise: 01:33 (12/31) Moonset: 12:40 Moon Visible (y/n): N

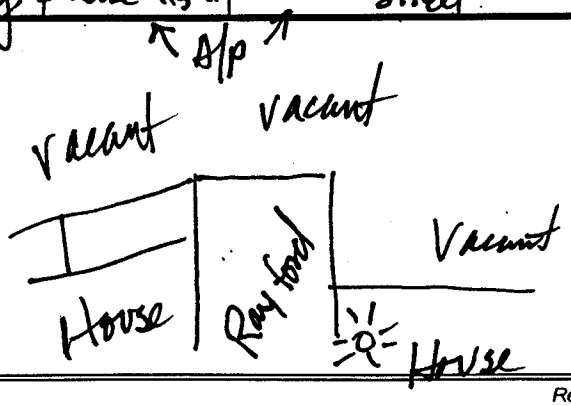
ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	.044	.043	0.033
viewing	Shrub	Sky & A/P glow	Vegetation
30°	0.034	.036	0.025
viewing	Vacant lot w/ st. & A/P lights	Sky & A/P glow	~~0.025~~ Vegetation
60°	0.026	0.027	0.020
viewing	Vacant lot & A/P lights	Sky	curb
90°	0.023	0.024	0.019
viewing	St. lights & A/P	Sky	Street
120°	0.019	0.020	0.017
viewing	Vacant, trees, & St. lights	Sky	Street
150°	0.016	0.025	0.020
viewing	St. lights & trees	Sky	street
180°	0.024	0.043	0.037
viewing	Vacant lot	Sky, & house light	Street

NOTES:

Some glow from A/P lights in clouds (reflections)





Rev. 1

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	Date: 12/30/1999
Location: Rear of Apt Bldg @ 9400 La Tijera by side near Loyola Blvd.	Time: 2115
	Sunset: 16:53
GPS: Lat: 33 · 57 · 17 " Long: 118 · 24 · 58 "	Civil Twilight: 17:21
Viewshed: Vacant lot w/ A/P Control Tower in distance	Engr(s): RAM / RCW

N

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: 53.9 °F 83 %RH 0-3 / ? Wind Speed/Dir

Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☒ Partly Cloudy ☐ Hazy/Smoggy

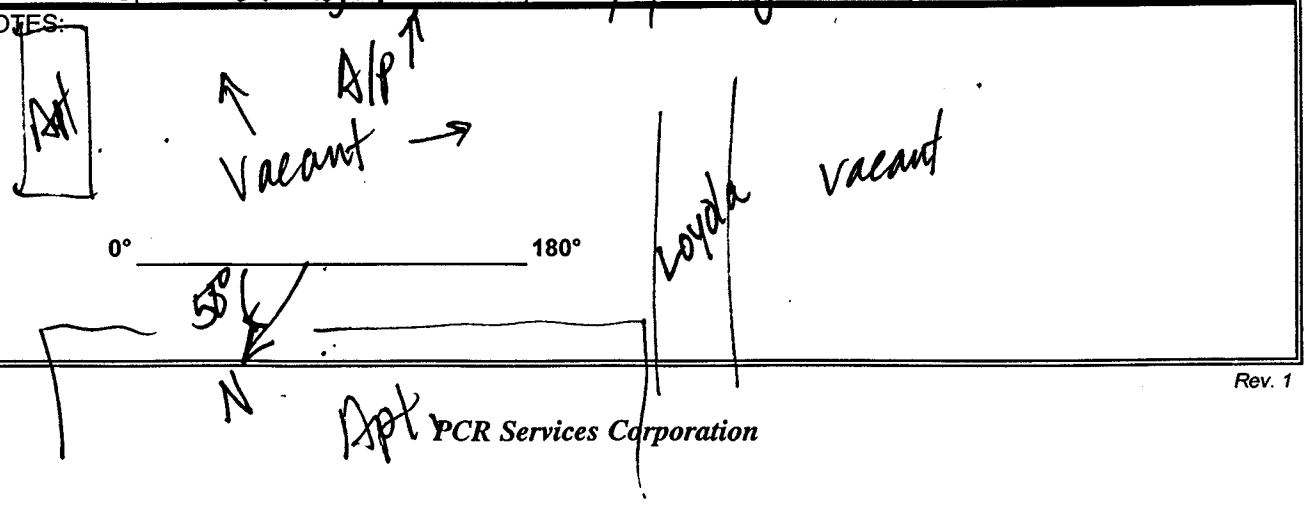
Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New 38 % disk illum'd

Moonrise: 01:33 (12/31) Moonset: 12:40 Moon Visible (y/n): N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0° viewing	0.064 edge of bldg	0.067 sky	0.048 sidewalk
30° viewing	0.053 vacant lot & dist bldg	0.046 sky	0.036 vegetation
60° viewing	0.055 field & A/P tower	0.056 sky	0.039 vegetation
90° viewing	0.068 field & dist. A/P	0.071 sky	0.046 vegetation
120° viewing	0.075 St. lights	0.077 sky & St. lights	0.058 vegetation
150° viewing	0.074 St. lights	0.076 sky & St. lights	0.055 vegetation
180° viewing	0.064 St. lights	0.065 sky & St. lights	.049 sidewalk

NOTES:



ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	Date: 12/30/1999
Location: In front of 6645 W. 88th St.	Time: 2136
	Sunset: 16:53
GPS: Lat: 33 ° 57 · 25 " Long: 118 ° 24 · 18 "	Civil Twilight: 17:21
Viewshed: walkway w/ trees before berm & wall	Engr(s): RAM / RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: 55 °F 72 %RH 0-1 — Wind Speed/Dir

Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☒ Partly Cloudy ☐ Hazy/Smoggy

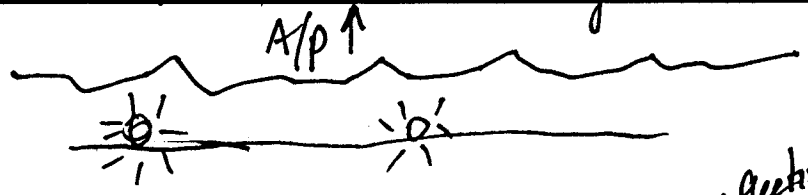
Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New 38 % disk illum'd

Moonrise: 01:33 (12/31) Moonset: 12:40 Moon Visible (y/n): N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0° viewing	0.083 St. lights	0.082 Sky & St. lights	0.066 Sidewalk
30° viewing	0.080 St. lights	0.082 Sky & light	0.064 curb
60° viewing	0.067 berm & wall	.067 Sky	0.051 Street
90° viewing	0.050 berm & wall	.050 Sky	0.035 Street
120° viewing	.032 berm & wall	.036 sky	0.022 Street
150° viewing	.031 St. light & trees	0.037 Sky & St. light	0.028 Street
180° viewing	.042 St. lights & house light	0.043 Sky	0.031 curb

NOTES:



88 ↓

Houses N Houses Houses

Some reflective 'glow' from clouds over A/P

8' wall on top of 8' berm cuts off views & lights of A/P (no impact expected unless elevated lighting)

ILLUMINANCE SURVEY

Field Data Sheet

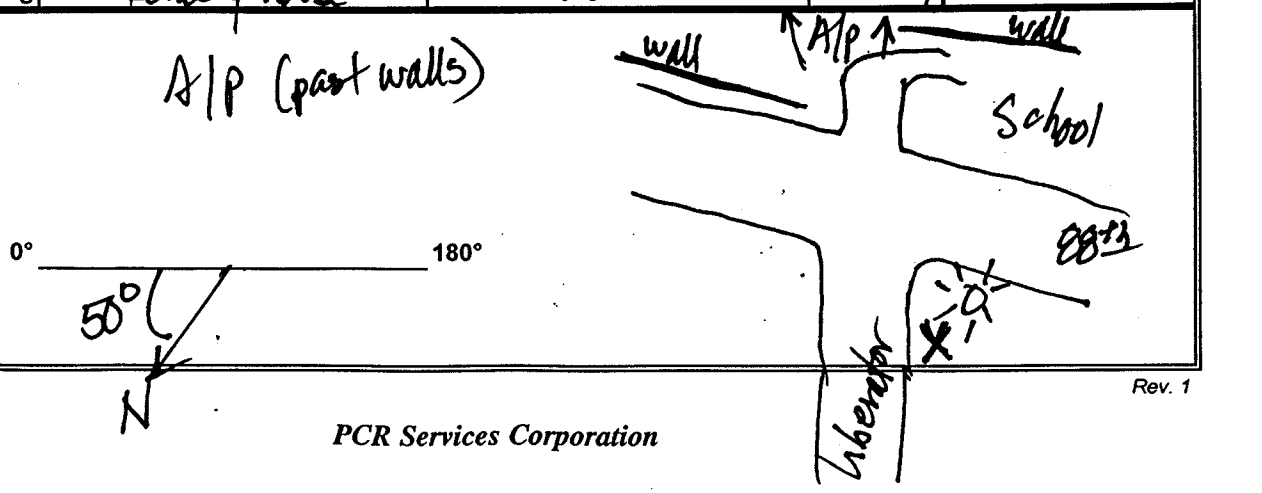
Project: LAX MASTER PLAN	Date: 12/30/1999
Location: In front of 8763 Liberator (@ NW corner of Liberator & W. 88th St.)	Time: 2147
	Sunset: 16:53
GPS: Lat: 33 ° 57 · 27 " Long: 118 ° 24 · 07 "	Civil Twilight: 17:21
Viewshed: Walls w/ break to see A/P, then school	Engr(s): RAM / RCW
Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head	S/N: B022200
Weather: 56 °F 74 %RH 0 / — Wind Speed/Dir	
Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☒ Partly Cloudy ☐ Hazy/Smoggy	
Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New 38 % disk illum'd	
Moonrise: 01:33 (12/31) Moonset: 12:40 Moon Visible (y/n): N	

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	0.193	0.190	0.152
viewing	horses	sky	grass & curb
30°	0.173	0.296	0.112
viewing	street & st. lights	sky	grass
60°	0.256	0.287	0.168
viewing	wall & A/P	sky & lights of A/P	grass
90°	0.347	0.355	0.252
viewing	school & st. lights	sky & st. light.	sidewalk
120°	0.373	0.374	0.273
viewing	school & st. lights	st. light	shrub & light from st. light
150°	0.306	0.321	0.220
viewing	shrubs	tree & st. light	grass
180°	0.173	0.205	0.112
viewing	fence & house	tree	grass

NOTES:

A/P (past walls)



Rev. 1

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	**Date:** 12/30/1999
Location: In front of ~~6666~~ DeHavilland (E. side of street) about mid-block (approx. edge of take-over boundary) Q	**Time:** 2205
GPS: Lat: 33 · 57 · 23 " Long: 118 · 23 · 26 "	**Sunset:** 16:53
Viewshed: Residential street + to O/D, then long-term park'g lot	**Civil Twilight:** 17:21
	Engr(s): RAM / RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head **S/N:** B022200

Weather: 55.5 °F 76 %RH 0-3 / — Wind Speed/Dir

Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☐ Partly Cloudy ☒ Hazy/Smoggy

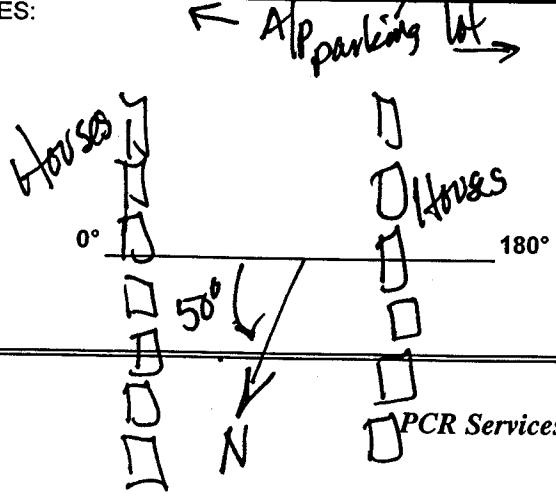
Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New 38 % disk illum'd

Moonrise: 01:33 (12/31) **Moonset:** 12:40 **Moon Visible (y/n):** N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	0.016	0.021	0.014
viewing	House	sky	grass
30°	0.031	0.033	0.025
viewing	car	sky	grass
60°	0.046	0042	0.032
viewing	house lights	Sky	grass
90°	.044	0.044	.034
viewing	parking lot lights	sky above parking	sidewalk
120°	0.037	0.04	.028
viewing	houses	sky	curb
150°	0.025	0.029	.019
viewing	House	sky	street
180°	0.016	0.018	.012
viewing	House	Sky	street

NOTES:



ILLUMINANCE SURVEY

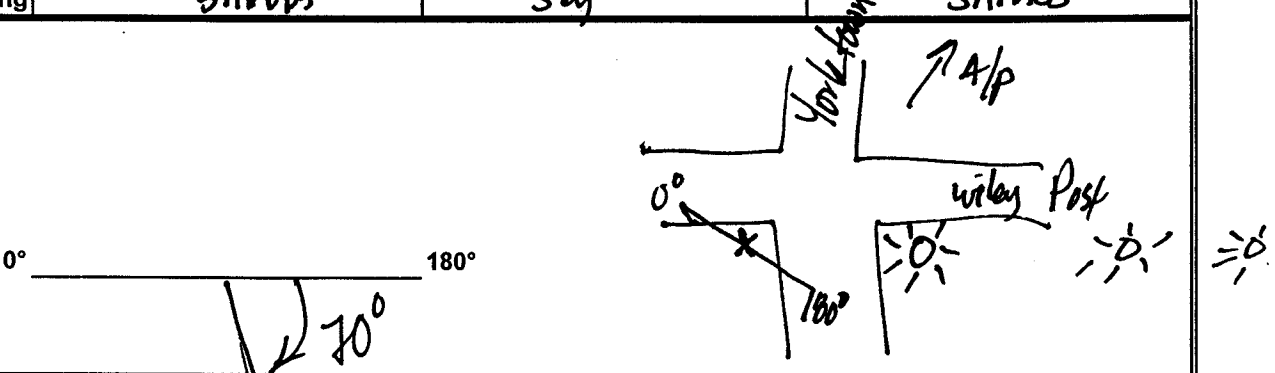
Field Data Sheet

Project: LAX MASTER PLAN		**Date:** 12/30/1999
Location: In Front of 8811 Wiley Post (NE corner of Wiley Post & Yorktown.)		**Time:** 2220
		Sunset: 16:53
GPS: Lat: 33 ° 57 · 28 "	**Long:** 118 ° 23 · 16 "	**Civil Twilight:** 17:21
Viewshed: A/P Terminals & parking lots (near landing track across ballfield & play park)		**Engr(s):** RAM / RCW
Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head		**S/N:** B022200
Weather: 55.3 °F 79 %RH 0-3 / — Wind Speed/Dir		
Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☒ Partly Cloudy ☐ Hazy/Smoggy		
Moon: ☒ Waning, 8 days past Full ☐ Waxing, ____ days past New		38 % disk illum'd
Moonrise: 01:33 (12/31) **Moonset:** 12:40	**Moon Visible (y/n):** N	

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	0.026	0.032	0.026
viewing	House	sky	Street
30°	0.066	0.100	0.037
viewing	House & street	tree	street
60°	0.158	0.179	0.011
viewing	Park & distant A/P	Sky over park	Street
90°	0.232	0.242	.171
viewing	A/P parking lot	Sky above A/P parking	~~street~~ sidewalk
120°	0.244	0.253	0.176
viewing	down street w/ lights	st. light	sidewalk
150°	.193	0.206	0.132
viewing	shrubs	Sky & st. light	dirt
180°	0.112	0.137	0.067
viewing	shrubs	Sky	Shrubs

NOTES:



Rev. 1

PCR Services Corporation

ILLUMINANCE SURVEY

Field Data Sheet

Project: LAX MASTER PLAN	Date: 12/30/1999
Location: In front of 8730/8728 Ramsgate (E. side of street) @ approximate boundary of project. Homogenous lighting	Time: 2234
GPS: Lat: 33 · 57 · 30 " Long: 118 · 22 · 55 "	Sunset: 16:53
Viewshed: Fairly dark residential street w/ 1 & 2 story Apts	Civil Twilight: 17:21
	Engr(s): RAM / RCW

Photometer: Tektronix J17 Meter Body with Tektronix J1811 Illuminance Head S/N: B022200

Weather: 54.8 °F 79 %RH ___ / ___ Wind Speed/Dir

Sky: ☐ Clear ☐ Foggy ☐ Cloudy/Overcast ☒ Partly Cloudy ☐ Hazy/Smoggy

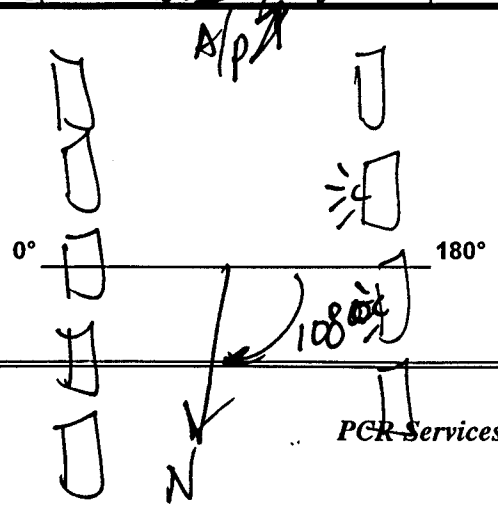
Moon: ☒ Waning, 8 days past Full ☐ Waxing, ___ days past New 38 % disk illum'd

Moonrise: 01:33 (12/31) Moonset: 12:40 Moon Visible (y/n): N

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal (looking out)	Horiz. +30 deg (looking up)	Horiz. -30 deg (looking down)
0°	0.036	0.037	0.027
viewing	House	sky over house	grass
30°	0.036	0.039	0.028
viewing	House	sky over house	grass
60°	0.036	0.040	0.027
viewing	House	sky	grass
90°	0.038	0.041	0.029
viewing	down street to A/P	sky	sidewalk
120°	0.045	0.048	0.033
viewing	House w/ light	sky	grass
150°	0.060	~~0.065~~ 0.065	0.044
viewing	House w/ lights	sky	grass
180°	0.082	0.095	0.061
viewing	House w/ lights	sky	curb

NOTES:



Some glow from reflections off clouds

No street lights, but several houses or apt. bldgs w/ area lights. Almost entire length of block is the same

Rev. 1

U.S. Naval Observatory
Astronomical Applications Department

Sun and Moon Data for One Day

The following information is provided for Los Angeles, Los Angeles County, California (longitude W118.4, latitude N34.1):

Monday
27 December 1999 Pacific Standard Time

SUN	
Begin civil twilight	6:30 a.m.
Sunrise	6:58 a.m.
Sun transit	11:55 a.m.
Sunset	4:51 p.m.
End civil twilight	5:19 p.m.
MOON	
Moonrise	9:37 p.m. on preceding day
Moon transit	4:23 a.m.
Moonset	11:01 a.m.
Moonrise	10:40 p.m.
Moonset	11:36 a.m. on following day

Phase of the Moon on 27 December: waning gibbous with 68% of the Moon's visible disk illuminated.

Last quarter Moon on 29 December 1999 at 6:05 a.m. Pacific Standard Time.

Census Bureau map of Los Angeles area

ILLUMINANCE SURVEY

PROJECT	LAX MASTER PLAN	DATE 12/27/99
LOCATION	770 W. IMPERIAL AVE	20:17
	WEST END OF ENTRANCE DRIVEWAY	
GPS A	CREST OF HILL @ W. END OF IMPERIAL AVE.	
LAT: 33° 55' 50"	LONG: -118° 25' 33"	

PHOTOMETER	Tektronix J17, J1811 Illuminance Head	S/N B022200
Weather Condition	64.6° F	
4' ABOVE G.L.	"LOW" RH (<30%)	
5 DAYS AFTER FULL MOON	0 WIND	

ILLUMINANCE, footcandles (measured 4 ft above ground level)

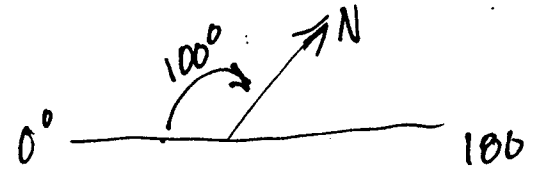
ANGLE	Horizontal	Vertical +30 deg	Vertical -30 deg
0°	0.072	0.074	0.056
		SKY & ST. LIGHT	SIDEWALK
30°	0.071	0.070	0.059
	CAR + DUNES + PERSHING DR.	SKY	CURB & GRASS
60°	0.062	0.061	0.053
	SHRUBBERY	SKY	CURB
90°	0.075	0.090	0.050
	VACANT SW A/P	SKY & ST. LIGHTS	CURB
120°	0.126	0.131	0.092
	SHRUBS & DISTANT A/P	SKY & ST. LIGHTS	CURB
150°	0.166	0.171	0.122
	DISTANT A/P	SKY & ST. LIGHTS	CURB
180°	0.175	0.186	0.125
NOTES:	ST. LIGHTS	ST. LIGHTS	SIDEWALK

Pershing

VACANT

A/P →

S. SIDE OF STREET



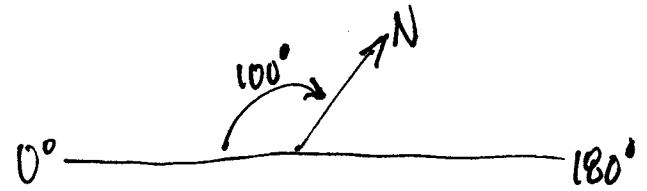
ILLUMINANCE SURVEY

PROJECT	LAX MASTER PLAN	DATE
LOCATION B	SE CORNER OF IMPERIAL AVE. & LOMA ~~LINDA~~ VISTA	12/27/19
	BY SAB W IMPERIAL AVE	20:55
GPS		
LAT: 33° 55' 50"	LONG: 118° 25' 18"	
PHOTOMETER	Tektronix J17, J1811 Illuminance Head	S/N B022200
Weather Condition	CLEAR SKIES 76 °F	
4' ABOVE GRADE	31 % RH	
5 DAYS PAST FULL MOON	0 WIND	

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal	Vertical +30 deg	Vertical -30 deg
0°	0.30	0.325	0.207
	ST. LIGHTS & HOUSE LIGHTS	ST. LIGHT	CURB
30°	0.293	0.31	0.197
	CARS & TREES*	SKY & ST. LIGHT	CURB
60°	0.214	0.241	0.14
	TREES *	SKY	CURB & GRASS
90°	0.105	0.137	0.050
	TREES*	SKY	CURB & GRASS
120°	0.065	0.072	0.058
	TREES* & PARKWAY	SKY	CURB & GRASS
150°	0.102	0.094	0.089
	TREES* & PARKWAY	SKY & TREES	CURB & GRASS
180°	0.125	0.110	0.105
NOTES:	ST. LIGHTS & BLDG LIGHTS	ST. LIGHTS	SIDEWALK

* ACROSS IMPERIAL AVE.



S. SIDE OF STREET IN DEPRESSION (BELOW IMPERIAL HWY). CAN'T SEE IMP. HWY CARS. CAN'T SEE ANY A/P LIGHTS OR BLDGS (HIDDEN BY BERM)

ILLUMINANCE SURVEY

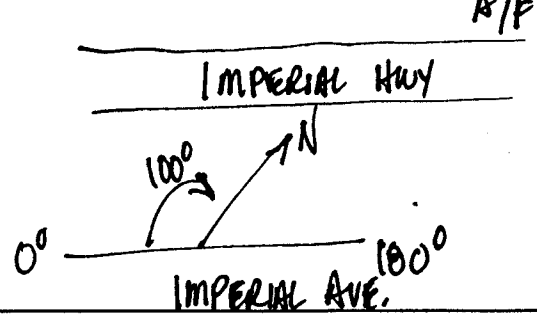
PROJECT	LAX MASTER PLAN	DATE
LOCATION	WEST END OF APT. BLDG. @ 424 W IMPERIAL AVE	12/27/99
	(BY DRIVEWAY ENTRANCE)	20:49
GPS C		
LAT: 33° 55' 51"	LONG: 118° 25' 12"	4' ABOVE GRADE

PHOTOMETER	Tektronix J17, J1811 Illuminance Head	S/N B022200
Weather Condition	60.5°F	
CLEAR SKY	38 % RH	
5 DAYS PAST FULL MOON	Ø WIND	

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal	Vertical +30 deg	Vertical -30 deg
0°	0.191	0.147	0.252
	ST. LIGHTS	SKY	SIDEWALK
30°	0.323	0.277	0.260
	TREES & CARS	SKY	CURB & ST.
60°	0.515	0.428	0.450
	TREES & ST. LIGHTS	SKY & ST. LIGHTS	CURB & ST.
90°	0.633	0.517	0.546
DIST.	A/P CARGO BLDGS	SKY	CURB & GRASS
120°	0.613	0.515	0.560
DIST	A/P BLDGS	SKY	CURB & GRASS
150°	0.476	0.418	0.462
	TREES & CARS	TREES	CURB & GRASS
180°	0.333	0.270	0.350

NOTES: ST. LIGHTING — TREES & ST. LIGHTS — SIDEWALK



S. SIDE OF STREET
- AT SLIGHT RISE IN ELEV.
- CONSIDERABLE PARTS OF A/P VISIBLE

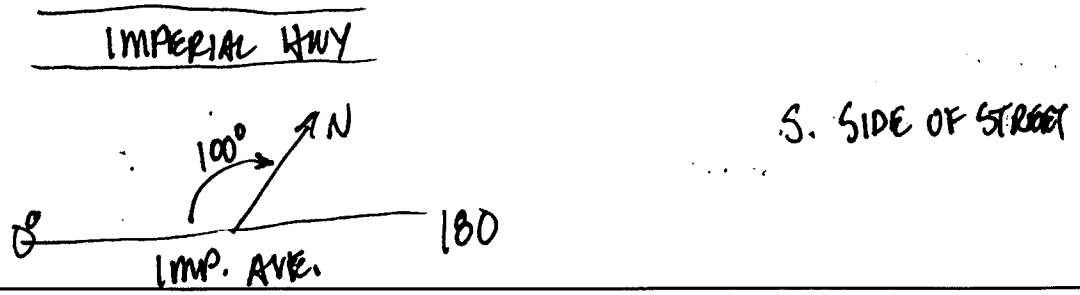
ILLUMINANCE SURVEY

PROJECT	LAX MASTER PLAN	DATE
LOCATION	206 E. IMPERIAL AVE.	12/29/99
	1ST REG. EAST OF COMM'L AROUND MAIN ST.	21:08
GPS D		
LAT: 33° 55' 52"	LONG: 118° 24' 48"	4' ABOVE GRADE
PHOTOMETER	Tektronix J17, J1811 Illuminance Head	S/N B022200
Weather Condition	CLEAR SKIES 63.4 °F	
	32 %RH	
	ϕ WIND	

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal	Vertical +30 deg	Vertical -30 deg
0°	0.122	0.123	0.106
	COMM'L SIGNS (LIT)	SKY & SIGNAGE	SIDEWALK & SIGN LIGHTING ~~LIGHTING~~
30°	0.117	0.105	0.098
	CARS & ST. LIGHTS	SKY &	DRIVEWAY
60°	0.093	0.092	0.081
	IMP HWY & A/P BLDGS	SKY & DIST. A/P	DRIVEWAY
90°	0.083	0.070	0.065
	IMP HWY & A/P BLDGS	SKY & ST.	CURB & ST.
120°	0.095	0.069	0.069
	IMP HWY & A/P BLDGS	SKY & ST. LAMP	CURB & DIRT
150°	0.080	0.071	0.072
	DIST A/P BLDGS.	SKY & ST. LAMPS	CURB & DIRT
180°	0.056	0.060	0.056

NOTES: ST. LIGHTING TREES SIDEWALK



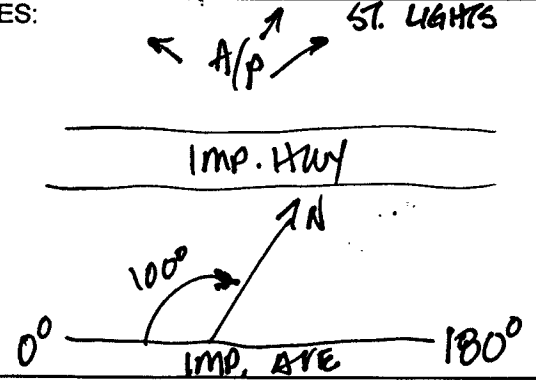
ILLUMINANCE SURVEY

PROJECT	LAX MASTER PLAN	DATE
LOCATION	422 E IMPERIAL AVE (HOUSE)	12/29/99
	(1 HOUSE AWAY FROM SW CORNER OF	21:22
GPS	IMP. AVE & SHELDON)	
LAT: 33° 55' 51"	LONG: 118° 24' 38"	4' ABOVE GRADE
PHOTOMETER	Tektronix J17, J1811 Illuminance Head	S/N B022200
Weather Condition	CLEAR SKIES 62.1 °F	
	32 %RH	
	0 WIND	

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal	Vertical +30 deg	Vertical -30 deg
0°	0.093	0.090	0.073
	ST. LIGHTS	TREE & ST. LIGHT	SIDEWALK
30°	0.104	0.097	0.085
	CARS & DIST. A/P	SKY & ST. LIGHTS	CURB & GRASS
60°	0.104	0.095	0.086
	DIST. A/P HANGARS	SKY	CURB & GRASS
90°	0.101	0.100	0.08
	RWY LIGHTS & HANGARS	SKY	CURB & GRASS
120°	0.126	0.110	0.106
	A/P TERM & CON TWR	SKY OVER A/P	CURB & GRASS
150°	0.144	0.140	0.144
	A/P BLDGS	SKY OVER A/P	CURB & GRASS
180°	0.148	0.165	0.153
	ST. LIGHTS	TREE & ST. LIGHT	SIDEWALK

NOTES:



S. SIDE OF STREET
TOP OF SLIGHT RISE
OVERLOOKING MOST OF A/P

ILLUMINANCE SURVEY

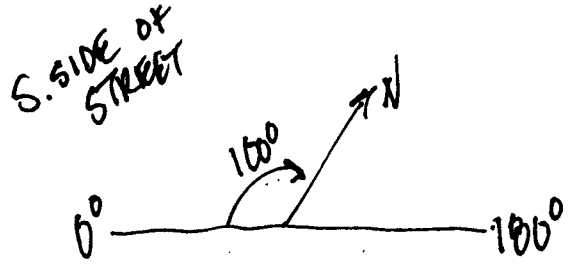
PROJECT	LAX MASTER PLAN	DATE
LOCATION	620 E. IMPERIAL AVE. (APT. BLDG)	12/2[illegible]/99
F	E. END OF BLDG. BY ENT. DRIVEWAY	2142
GPS	(INTERMEDIATE ELEV.	
LAT: 33° 55' 50"	LONG: 118° 24' 30"	

PHOTOMETER	Tektronix J17, J1811 Illuminance Head	S/N B022200
Weather Condition		
	CLEAR SKIES 61.9 °F	
	30 %RH	
	Ø WIND	

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal	Vertical +30 deg	Vertical -30 deg
0°	0.160	0.160	0.121
	ST. LIGHTS	ST. LIGHTS	SIDEWALK & ST. LIGHTS (REAL)
30°	0.157	0.158	0.116
	ST. LIGHTS	SKY	CURB & GRASS
60°	0.117	0.120	0.080
	A/P BLDG LIGHTS	SKY	CURB & GRASS
90°	0.060	0.078	0.034
	TREES	SKY & TREES	CURB & GRASS
120°	0.061	0.060	0.046
	TREES & DIST A/P	SKY	CURB & GRASS
150°	0.085	0.080	0.068
	TREES & DIST A/P	SKY	DRIVEWAY
180°	0.090	0.086	0.074

NOTES: ST. LIGHTS SKY & ST. LIGHTS SIDEWALK



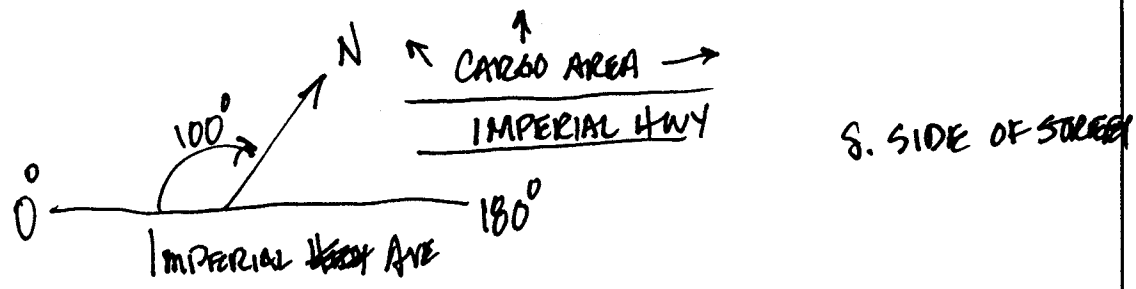
ILLUMINANCE SURVEY

PROJECT	LAX MASTER PLAN	DATE 12-27-99
LOCATION	1208 E. IMPERIAL ~~HIGHWAY~~ AVE	1940
	NE CORNER OF LOT, BY CORNER OF CL. FENCE	
GPS G	(FIRST RESIDENTIAL LOT ON IMPERIAL, S. OF SEPULVEDA)	
LAT: 33° 55' 51'	LONG: -118° 24' 8"	

PHOTOMETER	Tektronix J17, J1811 Illuminance Head	S/N B022200
Weather Condition	Clear Sky, 0 WIND	
	63.7°F	
5 DAYS AFTER FULL MOON	30%RH	

ILLUMINANCE, footcandles (measured 4 ft above ground level)

ANGLE	Horizontal	Vertical +30 deg	Vertical -30 deg
0°	0.087	0.120	0.072
		TREE	SIDEWALK
30°	0.125	0.140	0.112
		TREE & STREET LIGHT	CURB & GRASS
60°	0.182	0.154	0.150
	TREES & ST. LIGHT	ST. LIGHT	CURB & GRASS
90°	0.240	0.218	0.200
	CAR & CARGO	SKY	CURB & GRASS
120°	0.285	0.264	0.215
	CARGO BLDGS	SKY	CURB & GRASS
150°	0.300	0.285	0.224
	CARGO BLDGS & TOWER	SKY & ST. LIGHT	CURB & GRASS
180°	0.268	0.257	0.205
NOTES:	SIDEWALK & ST. LIGHTS	ST. LIGHT	SIDEWALK



Attachment B
Ambient Illuminance Measurements

LAX Expansion Master Plan EIS/EIR

Lighting Study

Baseline Ambient Illuminance Data, 12-28-99

	Location	Description	City	Latitude (GPS)			Longitude (GPS)			Date	Time	Temp	RH	Wind	Wind	Mag. North	Horizontal Illuminance, footcandles									
				deg.	min.	sec.	deg.	min.	sec.		(24-hour)	°F	%	Speed	Dir.	CW from 0°	0°	30°	60°	90°	120°	150°	180°	Avg.	Min.	Max.
Horizontal	A	770 W. Imperial Ave.	El Segundo	33	55	50	118	25	33	12/27/99	20:17	64.6	<30	0	-	100	0.072	0.071	0.062	0.075	0.126	0.166	0.175	0.11	0.06	0.18
	B	548 W. Imperial Ave.	El Segundo	33	55	50	118	25	18	12/27/99	20:35	60.6	31	0	-	100	0.300	0.293	0.214	0.105	0.065	0.102	0.125	0.17	0.07	0.30
	C	424 W. Imperial Ave.	El Segundo	33	55	51	118	25	12	12/27/99	20:49	60.5	38	0	-	100	0.191	0.323	0.515	0.633	0.613	0.476	0.333	0.44	0.19	0.63
	D	206 E. Imperial Ave.	El Segundo	33	55	52	118	24	48	12/27/99	21:08	63.4	32	0	-	100	0.122	0.117	0.093	0.083	0.095	0.080	0.056	0.09	0.06	0.12
	E	422 E. Imperial Ave.	El Segundo	33	55	51	118	24	38	12/27/99	21:22	62.1	32	0	-	100	0.093	0.104	0.104	0.101	0.126	0.144	0.148	0.12	0.09	0.15
	F	620 E. Imperial Ave.	El Segundo	33	55	50	118	24	30	12/27/99	21:42	61.9	30	0	-	100	0.160	0.157	0.117	0.060	0.061	0.085	0.090	0.10	0.06	0.16
	G	1208 E. Imperial Ave.	El Segundo	33	55	51	118	24	8	12/27/99	19:40	63.7	30	0	-	100	0.087	0.125	0.182	0.240	0.285	0.300	0.268	0.21	0.09	0.30
																	Horizontal Plane +30° (looking sky-ward) Illuminance, footcandles									
																	0°	30°	60°	90°	120°	150°	180°	Avg.	Min.	Max.
Horizontal +30°	A	770 W. Imperial Ave.	El Segundo	33	55	50	118	25	33	12/27/99	20:17	64.6	<30	0	-	100	0.074	0.070	0.061	0.090	0.131	0.171	0.186	0.11	0.06	0.19
	B	548 W. Imperial Ave.	El Segundo	33	55	50	118	25	18	12/27/99	20:35	60.6	31	0	-	100	0.325	0.310	0.241	0.137	0.072	0.094	0.110	0.18	0.07	0.33
	C	424 W. Imperial Ave.	El Segundo	33	55	51	118	25	12	12/27/99	20:49	60.5	38	0	-	100	0.147	0.277	0.428	0.517	0.515	0.418	0.270	0.37	0.15	0.52
	D	206 E. Imperial Ave.	El Segundo	33	55	52	118	24	48	12/27/99	21:08	63.4	32	0	-	100	0.123	0.105	0.092	0.070	0.069	0.071	0.060	0.08	0.06	0.12
	E	422 E. Imperial Ave.	El Segundo	33	55	51	118	24	38	12/27/99	21:22	62.1	32	0	-	100	0.090	0.097	0.095	0.100	0.110	0.140	0.165	0.11	0.09	0.17
	F	620 E. Imperial Ave.	El Segundo	33	55	50	118	24	30	12/27/99	21:42	61.9	30	0	-	100	0.160	0.158	0.120	0.078	0.060	0.080	0.086	0.11	0.06	0.16
	G	1208 E. Imperial Ave.	El Segundo	33	55	51	118	24	8	12/27/99	19:40	63.7	30	0	-	100	0.120	0.140	0.154	0.218	0.264	0.285	0.257	0.21	0.12	0.29
																	Horizontal Plane -30° (looking ground-ward) Illuminance, footcandles									
																	0°	30°	60°	90°	120°	150°	180°	Avg.	Min.	Max.
Horizontal -30°	A	770 W. Imperial Ave.	El Segundo	33	55	50	118	25	33	12/27/99	20:17	64.6	<30	0	-	100	0.056	0.059	0.053	0.050	0.092	0.122	0.125	0.08	0.05	0.13
	B	548 W. Imperial Ave.	El Segundo	33	55	50	118	25	18	12/27/99	20:35	60.6	31	0	-	100	0.207	0.197	0.140	0.050	0.058	0.089	0.105	0.12	0.05	0.21
	C	424 W. Imperial Ave.	El Segundo	33	55	51	118	25	12	12/27/99	20:49	60.5	38	0	-	100	0.252	0.260	0.450	0.546	0.560	0.462	0.350	0.41	0.25	0.56
	D	206 E. Imperial Ave.	El Segundo	33	55	52	118	24	48	12/27/99	21:08	63.4	32	0	-	100	0.106	0.098	0.081	0.065	0.069	0.072	0.056	0.08	0.06	0.11
	E	422 E. Imperial Ave.	El Segundo	33	55	51	118	24	38	12/27/99	21:22	62.1	32	0	-	100	0.073	0.085	0.086	0.080	0.106	0.144	0.153	0.10	0.07	0.15
	F	620 E. Imperial Ave.	El Segundo	33	55	50	118	24	30	12/27/99	21:42	61.9	30	0	-	100	0.121	0.116	0.080	0.034	0.046	0.068	0.074	0.08	0.03	0.12
	G	1208 E. Imperial Ave.	El Segundo	33	55	51	118	24	8	12/27/99	19:40	63.7	30	0	-	100	0.072	0.112	0.150	0.200	0.215	0.224	0.205	0.17	0.07	0.22

LAX Expansion Master Plan EIS/EIR

Lighting Study

Baseline Ambient Illuminance Data, 12-30-99

	Location	Description	City	Latitude (GPS)			Longitude (GPS)			Date	Time	Temp	RH	Wind	Wind	Mag. North	Horizontal Illuminance, footcandles									
				deg.	min.	sec.	deg.	min.	sec.		(24-hour)	°F	%	Speed	Dir.	CW from 0°	0°	30°	60°	90°	120°	150°	180°	Avg.	Min.	Max.
Horizontal	H	600 Block of Franklin Ave.	El Segundo	33	55	5	118	25	16	12/30/99	18:15	57.2	73	0	-	189	0.022	0.011	0.007	0.007	0.011	0.015	0.019	0.01	0.01	0.02
	I	Loma Vista & Binder Pl.	El Segundo	33	54	56	118	25	13	12/30/99	18:50	56.4	77	0-5	W	185	0.880	0.349	0.097	0.172	0.236	0.249	0.208	0.31	0.10	0.88
	J	Napoleon & Rindge Ave. (SE)	Playa Del Rey	33	57	6	118	26	36	12/30/99	19:46	53.6	85	0-5	W	0	0.046	0.037	0.023	0.016	0.014	0.011	0.007	0.02	0.01	0.05
	K	255 Waterview	Playa Del Rey	33	57	8	118	26	33	12/30/99	20:05	55.2	82	0-7	W	320	0.022	0.031	0.034	0.029	0.019	0.016	0.016	0.02	0.02	0.03
	L	9000 Block of Falmouth Ave.	Playa Del Rey	33	57	16	118	26	0	12/30/99	20:30	56.7	71	0	-	315	0.025	0.034	0.038	0.033	0.029	0.024	0.027	0.03	0.02	0.04
	M	South end of Rayford Dr.	Playa Del Rey	33	57	15	118	25	19	12/30/99	20:51	55.4	74	0	-	280	0.044	0.034	0.026	0.023	0.019	0.016	0.024	0.03	0.02	0.04
	N	Behind Apt. at 9400 La Tijera	Playa Del Rey	33	57	17	118	24	58	12/30/99	21:15	53.9	83	0-3	?	310	0.064	0.053	0.055	0.068	0.075	0.074	0.064	0.06	0.05	0.08
	O	6645 W. 88th St.	S. Westchester	33	57	25	118	24	18	12/30/99	21:36	55	72	0	-	260	0.083	0.080	0.067	0.050	0.032	0.031	0.042	0.06	0.03	0.08
	P	8763 Liberator Ave.	S. Westchester	33	57	27	118	24	7	12/30/99	21:47	56	74	0	-	310	0.193	0.173	0.256	0.347	0.373	0.306	0.173	0.26	0.17	0.37
	Q	8838 DeHavilland Ave.	Los Angeles	33	57	23	118	23	26	12/30/99	22:05	55.5	76	0-3	?	310	0.016	0.031	0.046	0.044	0.037	0.025	0.016	0.03	0.02	0.05
	R	8811 Wiley Post	Los Angeles	33	57	28	118	23	16	12/30/99	22:20	55.3	79	0-3	?	250	0.026	0.066	0.158	0.232	0.244	0.193	0.112	0.15	0.03	0.24
	S	8730 Ramsgate Ave.	Los Angeles	33	57	30	118	22	55	12/30/99	22:34	54.8	79	0	-	280	0.036	0.036	0.036	0.038	0.045	0.060	0.082	0.05	0.04	0.08

																	Horizontal Plane +30° (looking sky-ward) Illuminance, footcandles									
																	0°	30°	60°	90°	120°	150°	180°	Avg.	Min.	Max.
Horizontal +30°	H	600 Block of Franklin Ave.	El Segundo	33	55	5	118	25	16	12/30/99	18:15	57.2	73	0	-	189	0.032	0.019	0.012	0.013	0.015	0.022	0.028	0.02	0.01	0.03
	I	Loma Vista & Binder Pl.	El Segundo	33	54	56	118	25	13	12/30/99	18:50	56.4	77	0-5	W	185	1.366	0.879	0.400	0.157	0.200	0.210	0.205	0.49	0.16	1.37
	J	Napoleon & Rindge Ave. (SE)	Playa Del Rey	33	57	6	118	26	36	12/30/99	19:46	53.6	85	0-5	W	0	0.045	0.036	0.023	0.015	0.014	0.011	0.008	0.02	0.01	0.05
	K	255 Waterview	Playa Del Rey	33	57	8	118	26	33	12/30/99	20:05	55.2	82	0-7	W	320	0.029	0.037	0.039	0.034	0.025	0.019	0.018	0.03	0.02	0.04
	L	9000 Block of Falmouth Ave.	Playa Del Rey	33	57	16	118	26	0	12/30/99	20:30	56.7	71	0	-	315	0.029	0.035	0.038	0.035	0.029	0.024	0.024	0.03	0.02	0.04
	M	South end of Rayford Dr.	Playa Del Rey	33	57	15	118	25	19	12/30/99	20:51	55.4	74	0	-	280	0.043	0.036	0.027	0.024	0.020	0.025	0.043	0.03	0.02	0.04
	N	Behind Apt. at 9400 La Tijera	Playa Del Rey	33	57	17	118	24	58	12/30/99	21:15	53.9	83	0-3	?	310	0.067	0.046	0.056	0.071	0.077	0.076	0.065	0.07	0.05	0.08
	O	6645 W. 88th St.	S. Westchester	33	57	25	118	24	18	12/30/99	21:36	55	72	0	-	260	0.082	0.082	0.067	0.050	0.036	0.037	0.043	0.06	0.04	0.08
	P	8763 Liberator Ave.	S. Westchester	33	57	27	118	24	7	12/30/99	21:47	56	74	0	-	310	0.190	0.296	0.287	0.355	0.374	0.321	0.205	0.29	0.19	0.37
	Q	8838 DeHavilland Ave.	Los Angeles	33	57	23	118	23	26	12/30/99	22:05	55.5	76	0-3	?	310	0.021	0.033	0.042	0.044	0.040	0.029	0.018	0.03	0.02	0.04
	R	8811 Wiley Post	Los Angeles	33	57	28	118	23	16	12/30/99	22:20	55.3	79	0-3	?	250	0.032	0.100	0.179	0.242	0.253	0.206	0.137	0.16	0.03	0.25
	S	8730 Ramsgate Ave.	Los Angeles	33	57	30	118	22	55	12/30/99	22:34	54.8	79	0	-	280	0.037	0.039	0.040	0.041	0.048	0.065	0.085	0.05	0.04	0.09

																	Horizontal Plane -30° (looking ground-ward) Illuminance, footcandles									
																	0°	30°	60°	90°	120°	150°	180°	Avg.	Min.	Max.
Horizontal -30°	H	600 Block of Franklin Ave.	El Segundo	33	55	5	118	25	16	12/30/99	18:15	57.2	73	0	-	189	0.016	0.005	0.004	0.006	0.007	0.010	0.011	0.01	0.00	0.02
	I	Loma Vista & Binder Pl.	El Segundo	33	54	56	118	25	13	12/30/99	18:50	56.4	77	0-5	W	185	0.286	0.090	0.117	0.182	0.233	0.257	0.239	0.20	0.09	0.29
	J	Napoleon & Rindge Ave. (SE)	Playa Del Rey	33	57	6	118	26	36	12/30/99	19:46	53.6	85	0-5	W	0	0.038	0.029	0.017	0.013	0.011	0.009	0.006	0.02	0.01	0.04
	K	255 Waterview	Playa Del Rey	33	57	8	118	26	33	12/30/99	20:05	55.2	82	0-7	W	320	0.017	0.025	0.027	0.022	0.015	0.012	0.012	0.02	0.01	0.03
	L	9000 Block of Falmouth Ave.	Playa Del Rey	33	57	16	118	26	0	12/30/99	20:30	56.7	71	0	-	315	0.022	0.029	0.031	0.031	0.027	0.024	0.029	0.03	0.02	0.03
	M	South end of Rayford Dr.	Playa Del Rey	33	57	15	118	25	19	12/30/99	20:51	55.4	74	0	-	280	0.033	0.025	0.020	0.019	0.017	0.020	0.037	0.02	0.02	0.04
	N	Behind Apt. at 9400 La Tijera	Playa Del Rey	33	57	17	118	24	58	12/30/99	21:15	53.9	83	0-3	?	310	0.048	0.036	0.039	0.046	0.058	0.055	0.049	0.05	0.04	0.06
	O	6645 W. 88th St.	S. Westchester	33	57	25	118	24	18	12/30/99	21:36	55	72	0	-	260	0.066	0.064	0.051	0.035	0.022	0.028	0.031	0.04	0.02	0.07
	P	8763 Liberator Ave.	S. Westchester	33	57	27	118	24	7	12/30/99	21:47	56	74	0	-	310	0.152	0.112	0.168	0.252	0.273	0.220	0.112	0.18	0.11	0.27
	Q	8838 DeHavilland Ave.	Los Angeles	33	57	23	118	23	26	12/30/99	22:05	55.5	76	0-3	?	310	0.014	0.025	0.032	0.034	0.028	0.019	0.012	0.02	0.01	0.03
	R	8811 Wiley Post	Los Angeles	33	57	28	118	23	16	12/30/99	22:20	55.3	79	0-3	?	250	0.026	0.037	0.011	0.171	0.176	0.132	0.067	0.09	0.01	0.18
	S	8730 Ramsgate Ave.	Los Angeles	33	57	30	118	22	55	12/30/99	22:34	54.8	79	0	-	280	0.027	0.028	0.027	0.029	0.033	0.044	0.061	0.04	0.03	0.06

LAX Expansion Master Plan EIS/EIR

Lighting Study

Baseline Ambient Illuminance Data, 1-5-00

	Location	Description	City	Latitude (GPS)			Longitude (GPS)			Date	Time	Temp	RH	Wind	Wind	Mag. North	Horizontal Illuminance, footcandles									
				deg.	min.	sec.	deg.	min.	sec.		(24-hour)	°F	%	Speed	Dir.	CW from 0°	0°	30°	60°	90°	120°	150°	180°	Avg.	Min.	Max.
Horizontal	Dunes 1a	Bottom of hill, by Pershing	Dunes Preserve	33	56	18	118	25	55	1/5/00	19:00	61.1	<20	0-2	?	30	0.174	0.203	0.204	0.225	0.230	0.233	0.182	0.21	0.17	0.23
	Dunes 1b	Mid-point up hill	Dunes Preserve	33	56	-	118	25	-	1/5/00	19:19	61	-	0	-	30	0.064	0.099	0.122	0.199	0.100	0.065	0.034	0.10	0.03	0.20
	Dunes 1c	Crest of hill	Dunes Preserve	33	56	47	118	26	0	1/5/00	19:30	61	-	0	-	30	0.026	0.053	0.074	0.079	0.064	0.040	0.010	0.05	0.01	0.08
	Dunes 1d	Center of Intersection, past Crest	Dunes Preserve	33	56	16	118	26	2	1/5/00	19:39	61.2	52	0	-	30	0.005	0.008	0.010	0.011	0.010	0.009	0.006	0.01	0.01	0.01
	Dunes 1e	Proceeding down hill, 1d + 100'	Dunes Preserve	33	56	-	118	26	-	1/5/00	20:00	60.1	52	0	-	20	-	-	0.010	0.011	0.009	-	-	0.01	0.01	0.01
	Dunes 1f	Further down hill, 1d + 200'	Dunes Preserve	33	55	-	118	26	-	1/5/00	20:05	60	52	0	-	20	-	-	0.010	0.009	0.008	-	-	0.01	0.01	0.01
	Dunes 1g	Stil further down hill, 1d + 300'	Dunes Preserve	33	56	16	118	26	5	1/5/00	20:10	60	52	0	-	20	-	-	0.008	0.008	0.007	-	-	0.01	0.01	0.01
	Dunes 2a	Bottom of hill, by Pershing	Dunes Preserve	33	56	3	118	25	47	1/5/00	20:45	58	-	0	-	30	0.032	0.044	0.051	0.052	0.041	0.031	0.018	0.04	0.02	0.05
	Dunes 2b	Mid-point up hill	Dunes Preserve	33	56	-	118	25	-	1/5/00	20:32	58	-	0	-	30	0.010	0.022	0.037	0.045	0.039	0.029	0.016	0.03	0.01	0.05
	Dunes 2c	Crest of hill	Dunes Preserve	33	56	1	118	25	52	1/5/00	20:17	58	65	0	-	30	0.030	0.048	0.058	0.056	0.046	0.028	0.015	0.04	0.02	0.06

																	Horizontal Plane +30° (looking sky-ward) Illuminance, footcandles									
																	0°	30°	60°	90°	120°	150°	180°	Avg.	Min.	Max.
Horizontal +30°	Dunes 1a	Bottom of hill, by Pershing	Dunes Preserve	33	56	18	118	25	55	1/5/00	19:00	61.1	<20	0-2	?	30	0.183	0.200	0.232	0.253	0.255	0.240	0.200	0.22	0.18	0.26
	Dunes 1b	Mid-point up hill	Dunes Preserve	33	56	-	118	25	-	1/5/00	19:19	61	-	0	-	30	0.057	0.087	0.110	0.110	0.093	0.065	0.034	0.08	0.03	0.11
	Dunes 1c	Crest of hill	Dunes Preserve	33	56	47	118	26	0	1/5/00	19:30	61	-	0	-	30	0.026	0.048	0.068	0.071	0.058	0.036	0.019	0.05	0.02	0.07
	Dunes 1d	Center of Intersection, past Crest	Dunes Preserve	33	56	16	118	26	2	1/5/00	19:39	61.2	52	0	-	30	0.006	0.008	0.010	0.010	0.011	0.010	0.007	0.01	0.01	0.01
	Dunes 1e	Proceeding down hill, 1d + 100'	Dunes Preserve	33	56	-	118	26	-	1/5/00	20:00	60.1	52	0	-	20	-	-	-	-	-	-	-	-	-	-
	Dunes 1f	Further down hill, 1d + 200'	Dunes Preserve	33	55	-	118	26	-	1/5/00	20:05	60	52	0	-	20	-	-	-	-	-	-	-	-	-	-
	Dunes 1g	Stil further down hill, 1d + 300'	Dunes Preserve	33	56	16	118	26	5	1/5/00	20:10	60	52	0	-	20	-	-	-	-	-	-	-	-	-	-
	Dunes 2a	Bottom of hill, by Pershing	Dunes Preserve	33	56	3	118	25	47	1/5/00	20:45	58	-	0	-	30	0.032	0.046	0.054	0.055	0.046	0.033	0.021	0.04	0.02	0.06
	Dunes 2b	Mid-point up hill	Dunes Preserve	33	56	-	118	25	-	1/5/00	20:32	58	-	0	-	30	0.011	0.025	0.036	0.042	0.040	0.032	0.017	0.03	0.01	0.04
	Dunes 2c	Crest of hill	Dunes Preserve	33	56	1	118	25	52	1/5/00	20:17	58	65	0	-	30	0.032	0.048	0.056	0.055	0.044	0.031	0.016	0.04	0.02	0.06

																	Horizontal Plane -30° (looking ground-ward) Illuminance, footcandles									
																	0°	30°	60°	90°	120°	150°	180°	Avg.	Min.	Max.
Horizontal -30°	Dunes 1a	Bottom of hill, by Pershing	Dunes Preserve	33	56	18	118	25	55	1/5/00	19:00	61.1	<20	0-2	?	30	0.134	0.155	0.137	0.148	0.164	0.164	0.122	0.15	0.12	0.16
	Dunes 1b	Mid-point up hill	Dunes Preserve	33	56	-	118	25	-	1/5/00	19:19	61	-	0	-	30	0.049	0.076	0.097	0.097	0.074	0.050	0.029	0.07	0.03	0.10
	Dunes 1c	Crest of hill	Dunes Preserve	33	56	47	118	26	0	1/5/00	19:30	61	-	0	-	30	0.024	0.048	0.065	0.067	0.055	0.030	0.014	0.04	0.01	0.07
	Dunes 1d	Center of Intersection, past Crest	Dunes Preserve	33	56	16	118	26	2	1/5/00	19:39	61.2	52	0	-	30	0.004	0.006	0.008	0.008	0.008	0.007	0.004	0.01	0.00	0.01
	Dunes 1e	Proceeding down hill, 1d + 100'	Dunes Preserve	33	56	-	118	26	-	1/5/00	20:00	60.1	52	0	-	20	-	-	-	-	-	-	-	-	-	-
	Dunes 1f	Further down hill, 1d + 200'	Dunes Preserve	33	55	-	118	26	-	1/5/00	20:05	60	52	0	-	20	-	-	-	-	-	-	-	-	-	-
	Dunes 1g	Stil further down hill, 1d + 300'	Dunes Preserve	33	56	16	118	26	5	1/5/00	20:10	60	52	0	-	20	-	-	-	-	-	-	-	-	-	-
	Dunes 2a	Bottom of hill, by Pershing	Dunes Preserve	33	56	3	118	25	47	1/5/00	20:45	58	-	0	-	30	0.019	0.032	0.036	0.036	0.028	0.022	0.013	0.03	0.01	0.04
	Dunes 2b	Mid-point up hill	Dunes Preserve	33	56	-	118	25	-	1/5/00	20:32	58	-	0	-	30	0.008	0.020	0.030	0.035	0.032	0.022	0.012	0.02	0.01	0.04
	Dunes 2c	Crest of hill	Dunes Preserve	33	56	1	118	25	52	1/5/00	20:17	58	65	0	-	30	0.021	0.035	0.042	0.040	0.021	0.018	0.011	0.03	0.01	0.04