



Memorandum

TO: HONORABLE MAYOR
AND CITY COUNCIL

FROM: Christopher Burton

SUBJECT: SEE BELOW

DATE: November 29, 2021

Approved

Date

11/29/21

COUNCIL DISTRICT: 3

SUPPLEMENTAL

SUBJECT: FILE NO. PP18-103. US 101 AIRPORT ELECTRONIC SIGNAGE PROJECT ADDENDUM.

REASON FOR SUPPLEMENTAL

A comment letter from Mark Baker, President of Soft Lights Foundation, was submitted to the San José City Attorney's Office on Thursday, November 11, 2021, at 3:06 PM. The letter contains seven pages of comments on the Zeiger Engineering lighting analysis technical report attached to the US 101 Airport Electronic Signage Initial Study/Addendum.

The letter was submitted outside of the public comment period for the Initial Study/Addendum and raises new analysis and information not previously submitted during the public comment period. Although staff is not obligated under the California Environmental Quality Act (CEQA) to respond to the untimely letter, staff prepared additional written responses to the letter as a matter of courtesy to be included as part of the administrative record. The comment letter with staff responses is attached to this supplemental memorandum.

BACKGROUND

The City circulated the Initial Study/Addendum for public review for 30 days from July 26, 2021 through August 25, 2021. This period exceeds CEQA mandated circulation periods because CEQA mandates do not require public circulation of Addendum documents. During public circulation, staff received approximately 198 comments on the Initial Study/Addendum. Staff published on the Department of Planning, Building, and Code Enforcement website a response to comments document on November 1, 2021. The Initial Study/Addendum and responses to comments can be found at <https://www.sanjoseca.gov/your-government/departments-offices/planning-building-code-enforcement/planning-division/environmental-planning/environmental-review/active-eirs/us-101-airport-electronic-signs>.

HONORABLE MAYOR AND CITY COUNCIL

November 30, 2021

Subject: File No. PP18-10 Supplemental

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The Initial Study/Addendum to the Norman Y Mineta San José International Airport Master Plan Environmental Impact Report (EIR) for the proposed project has been prepared in full compliance with CEQA and its implementing guidelines. The analysis is detailed, thorough and the conclusions are based on facts and substantial evidence in the records. Based on the analysis disclosed in the Initial Study/Addendum, associated technical reports, and all other hearing materials for the project, staff maintains that the Initial Study/Addendum is adequate, as a full environmental analysis was completed consistent with CEQA statutes, guidelines, and City's policies and requirements for CEQA compliance. Attachment 1 provides additional detailed responses to the new letter as a supplemental to the administrative record pertaining to the environmental analysis of the subject project.

/s/

CHRISTOPHER BURTON, DIRECTOR
Planning, Building and Code Enforcement

For questions please contact David Keyon, Principal Planner, at (408) 535-7898.

Attachments:

- Attachment 1 - Response to Comment Dated November 11, 2021, from the Soft Lights Foundation
- Attachment 2 - Letter from Mark Baker, Soft Lights Foundation, dated November 11, 2021

RESPONSE TO COMMENT DATED NOVEMBER 11, 2021 FROM THE SOFT LIGHTS FOUNDATION

Comment A.1: This letter is a rebuttal to the engineering report by Zeiger Engineers regarding the proposed LED billboards in San Jose. We assert that this engineering report is both heavily biased towards the LED billboard industry and seriously flawed technically, including the incorrect use of mathematics. Zeiger Engineers has conflated isotropic radiation from sources such as an incandescent lamp, and anisotropic radiation such as from LEDs, thus invalidating the entirety of the report.

Response A.1: Zeiger Engineers was consulted to assist in preparation of these responses to comments from the Soft Lights Foundation. Ronald Zeiger, President of Zeiger Engineers and lead author of the Lighting Analysis Report prepared for the project (refer to Appendix A to the Addendum), has over 39 years of experience in the areas of electrical engineering and lighting. The Lighting Analysis Report prepared for the project represents an analysis of the project's impacts by experts in the field, and provides substantial evidence to support the Addendum's conclusion that the project would result in less than significant impacts related to light and glare. Based on the facts set forth in further detail in the responses below, this comment letter does not provide substantial evidence that the project would result in significant environmental impacts.

The comment's classification of LED light emission as spatially anisotropic radiation is incorrect in the context of the project, as the LED light emission from the proposed signs would not be spatially anisotropic. Spatially anisotropic radiation as it pertains to light means the light is highly focused and is directed in a single direction, similar to a laser. Conversely, isotropic radiation radiates at the same intensity in all directions. LED light emissions from the proposed signs would be fractionally more narrow than completely isotropic.¹ While the signs would include design features to "direct" the light to its intended destination (i.e., U.S. 101), control over the direction of the light from the signs is mechanical in nature and is intended to shield surrounding areas from unwanted light that is radiating out from the light source due to its isotropic properties. The Lighting Analysis Report, therefore, used appropriate methodologies to determine the project's impacts related to light and glare.

Comment A.2: Figure 1 is a photo taken by the Soft Lights Foundation on November 6th, 2021 in Yakima, Washington. As is obvious from the photo, the LED radiation is exceedingly intense and is endangering the eye safety, physical safety and mental safety of pedestrians, drivers of vehicles, and even pilots of aircraft.

¹ The light emitted from the proposed signs would have a full-width half-maximum (FWHM) of 90 degrees, as verified by the manufacturer's data for the LEDs contained in the signs. An FWHM of 90 degrees means the viewing angle of the light from the LEDs would be 180 degrees, which for all practical purposes is isotropic.



Response A.2: The image in the comment is of an electronic sign, seemingly taken with a standard camera, hence the glare in the image. No information regarding the specifications of the sign (i.e., size, lighting technology, light levels, brightness controls, etc.) are provided, so a comparison to the signs proposed by the project cannot be made in any meaningful way. As discussed in the Addendum, the project includes design features to ensure light levels emitted by the proposed signs comply with all relevant regulations governing electronic signs which are intended to reduce potential hazards related to light and glare. The comment does not provide substantial evidence that the project would result in a significant environmental impact.

Comment A.3: Zeiger Engineers states that LED billboards emit an approximate maximum of 9,000 nits, but the report then uses invalid arguments and incorrect math to convince the reader that this 9,000 nit spatially anisotropic radiation is somehow perfectly safe and compliant with safety standards. We rebut those arguments.

Response A.3: The comment mischaracterizes the analysis in the report prepared by Zeiger Engineers (Appendix A to the Addendum). The report describes that LED billboards can achieve 9,000 nits under maximum daylight conditions with a maximized “white light” (i.e., where the red/blue/green LEDs are operating uniformly at maximum power). However, to operate at 100 percent white color, it would require turning off the ambient light sensor and disabling the dimming control of the face of the sign as well. In practice, the proposed signs would never operate under these conditions. Normal advertising images are not fully white, and the resulting colored brightness is substantially lower than white. A range of 3,600 - 5,000 nits is considered as typical of daytime peak power levels.

Comment A.4: Figure 2 (on the following page) is a diagram showing the categorization of radiation. As we can see in the chart, candles, incandescent light bulbs, and High-Pressure Sodium lamps are all spatially isotropic radiation sources. LEDs, on the other hand, emit spatially anisotropic radiation.

Response A.4: No source is provided for the diagram shown in the comment, nor is any supporting documentation provided to verify the information contained in the diagram. The diagram appears on the Soft Lights Foundation website and appears to have been created by the Soft Lights Foundation. In any event, as described in Response A.1, the LED lights in the proposed signs would not emit spatially anisotropic radiation.

Comment A.5: The Illuminating Engineering Society Recommended Practice for Design and Maintenance for Roadway Parking Facility Lighting (IES RP-8-18) is the de-facto standard for outdoor lighting for streets and parking lots. The references to “light” in IES RP-8-18 are for spatially isotropic radiation in the visible portion of the electromagnetic spectrum. The word “light” in IES RP-8-18 does not refer to microwaves, laser beams, or spatially anisotropic, spectrally incoherent radiation such as LEDs.

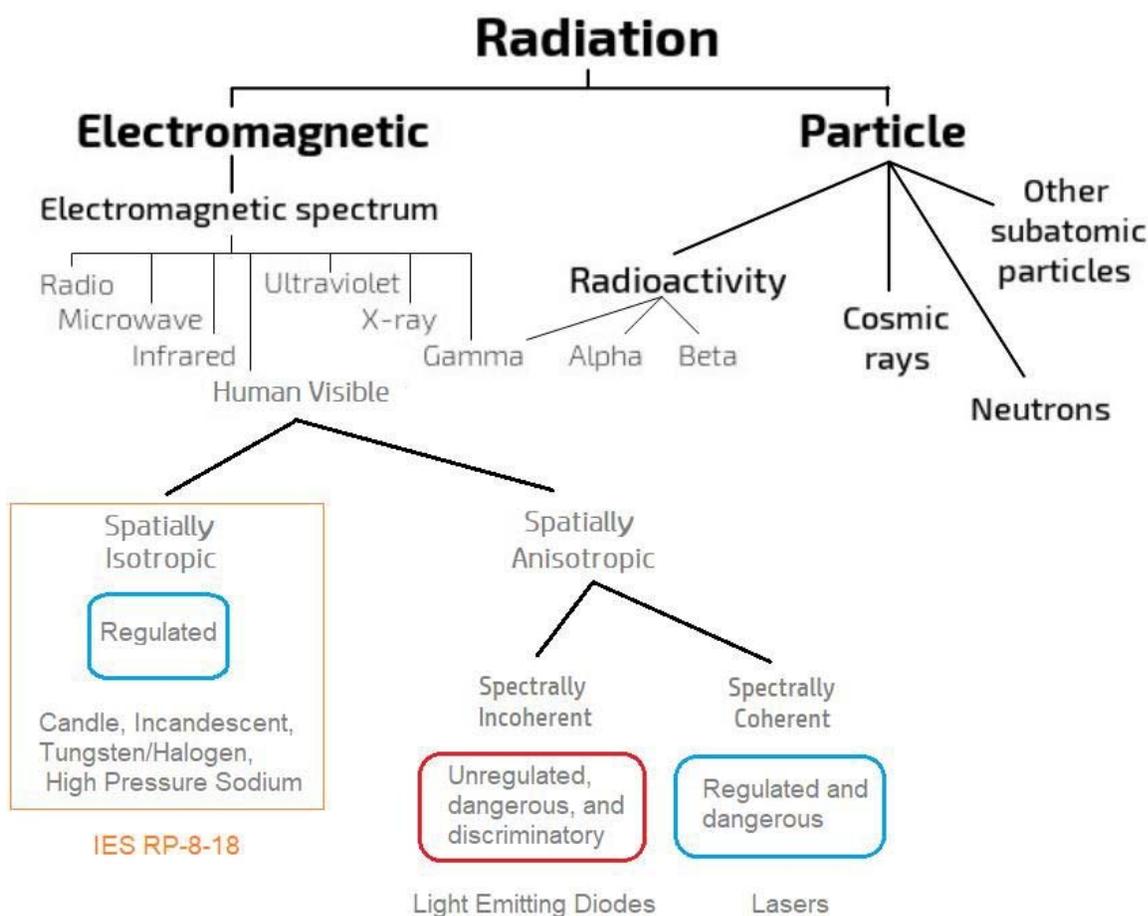


Figure 2 – Radiation Types

LEDs do not comply with existing standards, they emit dangerous radiation, discriminate against persons with light sensitivity disabilities and have unregulated spatial, temporal, and spectral characteristics. LED radiation has been shown to cause pain, sickness, eye damage, seizures,

migraines, psychological trauma, vehicle accidents, loss of liberty, thoughts of suicide and likely loss of life.

To our knowledge, there are no ocular exposure standards for LEDs. In his 2009 presentation, Senior Engineer Michael Shulman of Underwriters Laboratories wrote, "Currently, neither the U.S. nor Canada have mandatory standards or regulations for ocular exposure to LEDs emitting incoherent visible light."² In the research article, titled Light Emitting Diode Induced Retinal Damage³ the authors state, "Excessive LED light exposure presents a potential hazard to retinal function." In other research, those in Risk Group 3 (those with epilepsy, autism, migraines, photophobia, etc.) are often purposely ignored during the research, invalidating results that might have shown that LEDs are safe.

Response A.5: The comment refers to various studies and/or statements that assert LED light may be harmful to human health. None of the studies or information sources referred to in the comment specifically analyzed the effects of LED light from electronic signs, let alone the effects of LED light from the specific signs proposed by the project. Notably, the only study referenced in the comment for which a source was provided analyzed the effects of "excessive" exposure to LED light. The study exposed rats to LED light at various wavelengths for 12 hours per day for periods ranging from three to 28 consecutive days. LED light from the proposed signs would only be experienced briefly by individuals who pass by the signs and is not comparable to the conditions analyzed in the cited study. The comment, therefore, does not provide substantial evidence that the proposed project would result in significant environmental impacts.

Comment A.6: In the paragraphs below, we will address specific statements in the Zeiger Engineers report. The quotes are in the same order as they are written in the report.

Quote: "Project Design will also produce very little glare and potential for pilot distraction in the landing approach from the North (Runways 12L/12R) or South (Runways 30L/30R) due to the light control features on the billboards."

Zeiger Engineers makes substantial effort to note how these LED billboards will have special features to prevent the LED radiation from reaching the eyes of pilots. In other words, Zeiger Engineers and Clear Channel concede that the toxic radiation from LEDs is so harmful to human eyes and human vision that they are introducing special controls to keep this LED radiation out of the eyes of pilots. The implication is that Clear Channel and Zeiger Engineers believe that the eyes and nervous systems of drivers on the freeway do not merit the same concerns and that shining hazardous spatially anisotropic radiation into the eyes of drivers is perfectly within their rights as a corporation.

Response A.6: The Addendum (including the Lighting Analysis Report in Appendix A) analyzed the potential impacts of the project on Airport operations and drivers on U.S. 101. As noted previously, the analysis was based on the design and operating

² http://www.softlights.org/wp-content/uploads/2021/10/MichaelShulman_LEDFireElectricalSafety.pdf

³ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5313540/>

characteristics of the proposed signs, not a hypothetical sign operating at full power without controls. The analysis concluded that the proposed signs will comply with Caltrans and City regulations, such regulations designed to avoid adverse effects on human health. Based on this analysis, the Addendum concluded that the project's impacts would be less than significant. The comment does not provide substantial evidence that the project would result in a significant impact with regard to Airport operations or drivers on U.S. 101.

Comment A.7: Quote: “The billboards will control unwanted light (trespass or spill light) toward nearby airport operations, airport control tower, and Guadalupe River and riparian habitat.”

All LED billboard radiation is unwanted. 93% of the public oppose being subjected to toxic LED radiation. The primary entity that desires the toxic radiation from LED billboards is Clear Channel in their pursuit of profits. As per the Zeiger report, significant engineering effort is being made to control the LED radiation so that is directed only into the eyes of drivers on the freeway, and not into the eyes of pilots or into the sky. The very idea of purposely directing harmful radiation into the eyes of the public is a clear violation of civil rights and leaves San Jose liable for all claims of eye damage, vehicle crashes, emotional trauma and civil rights violations.

Response A.7: As discussed in Response A.6, the Addendum concluded that the impacts of the project on drivers on U.S. 101 would be less than significant. The remainder of the comment does not raise any specific environmental issues or concerns with the adequacy of the analyses in the Addendum and, therefore, no further response is required.

Comment A.8: Quote: “However, to operate at 100 percent white color, it would require turning off the ambient light sensor and disabling dimming control of the face as well. Normal advertising images are of course not “white”, and the resulting “colored” brightness is greatly less than white as when the LEDs are operating much more efficiently.”

We have seen many occurrences of LED billboards displaying 100 percent white. Frequently, this event occurs due to a technician error, setting the controller to display 100% white during routine maintenance. The results of operator error such as this are devastating, especially for a pilot attempting to land a plane with 300 passengers on board or drivers attempting to drive safely on a freeway. Figure 3 shows an LED billboard displaying the same 100% white that Zeiger Engineers contends will never happen.



Figure 3 – LED Billboard Light

Response A.8: As referenced in the comment and described in the Addendum (including Appendix A), the project includes controls and safeguards that regulate the light levels emitted by the signs. The “100% white” scenario described in the comment would be extremely unlikely to occur since it would require a person to manually turn off the controls and safeguards built into the proposed signs, and there is no operational reason for this to occur. Based on these facts, the City concludes that the comment does not provide substantial evidence that the project would result in a significant impact with regard to Airport operations or drivers on U.S. 101.

Comment A.9: Quote: “Due to the upper shielding on the LED modules providing an 18 degree cutoff, planes within 1-mile of the billboards would need to be below 1,700 feet altitude to first observe the display, and at that distance the illumination would be less than 0.0012 footcandle (0.012 lux).”

The concept of “illumination” from an LED billboard is an inappropriate measurement unit when discussing eye safety and pilot vision. We note that the critical flaw in the Zeiger analysis is ignoring the luminance and radiance of the LED radiation from the billboard, which is unaffected by distance. In addition, the Zeiger report uses incorrect mathematical calculations, erroneously attempting to convert a density measurement into an area measurement.

“Luminance” is the density of the LED light. The full 9,000 nits of the LED billboard will be stabbing the pilot in the eye just as the pilot is attempting to land the plane. The Federal Aviation Administration currently regulates the radiance from LED lasers and thus it is a federal crime to shine a laser at an airplane. LED radiation is just as dangerous, and yet the FAA has no regulations for spatially isotropic, spectrally incoherent radiation. It is up to the City of San Jose to protect pilots from hazardous radiation from LEDs.

Response A.9: Please refer to Response A.3 for clarification of the 9,000 nits value. As discussed in the Lighting Analysis Report completed by Zeiger Engineers, the project would include technical features to enhance light control, specifically spill light control, toward Airport operations and incoming pilots. Based on those facts, the Addendum concluded that the project’s impacts to Airport operations would be less than significant. The comment does not provide substantial evidence that the project would result in a significant impact with regard to Airport operations.

Comment A.10: Figure 4 shows an LED billboard in front of a church. This photo was taken by one of our members, who provided a description of how this LED radiation affect her. “Total freak out this morning. Beautiful morning so let my dog out the front yard for her morning constitution. When she went to the sidewalk and turned towards the church, I followed only to be blasted full on and lost my sight, meaning My eyes got this over exposure in a flash. I got frantic went to my side yard only to be even more sensitive to the church’s LED lights I couldn’t see the ground or make much of anything. I know where my house is so I went back to get an umbrella to shield my eyes so I could find my dog. She is home and I am still sight fuzzy and mentally and emotionally drained.”



Figure 4 – LED Billboard at Church

Response A.10: The comment discusses an experience of an individual after viewing an electronic sign. No information regarding the specifications of the sign (i.e., size, lighting technology, light levels, brightness controls, etc.) are provided, so a comparison to the signs proposed by the project cannot be made in any meaningful way. As discussed in the Addendum, the project includes design features to ensure light levels emitted by the proposed signs comply with all relevant regulations governing electronic signs which are intended to reduce potential hazards related to light and glare. The comment does not provide substantial evidence that the project would result in a significant environmental impact.

Comment A.11: Quote: “The above illuminations are much less than illumination of a full Moon, which typically provides only about 0.005 footcandle (0.05lux) –0.01 footcandle (0.1 lux) illumination.”

A comparison of spatially anisotropic radiation from LEDs to spatially isotropic radiation from the sun and then reflected off the moon is inappropriate. LEDs are a directed energy source and do not provide uniform illuminance. There is no comparison between moonlight and light energy from LEDs, as they are different types of radiation.

Response A.11: Please refer to Response A.1 regarding anisotropic radiation and isotropic radiation. The comment does not provide substantial evidence that the project would result in a significant environmental impact.

Comment A.12: Quote: “The conclusion is that billboards will provide no more potential for pilot distraction as compared to other commonly found illumination sources, such as moon light, parking lot illumination, automobile headlights, freeway signage, building illumination, etc.”

This is a false conclusion, as LED billboards are not “illumination sources.” LEDs emit highly directional, spatially anisotropic radiation that has been shown to cause eye damage, interference with the human nervous system, and loss of awareness that endangers the lives of pilots, airline passengers, drivers, and the public.

Response A.12: As stated in Response A.1, LED light emission from the proposed signs would not be spatially anisotropic. Further, the proposed electronic signs would have shielding of the LED’s providing a defined cutoff angle to upward spill light as well as side shields to prevent horizontal light control. The Lighting Analysis Report prepared by Zeiger Engineers and attached to the Addendum studied the pilot’s potential view of the proposed electronic signs on glide path and determined that there would be no issue with glare because the light levels reaching the pilots would be less than that of a full moon due to the shielding and dimming mechanisms included in the project design. The comment does not provide substantial evidence that the project would result in a significant environmental impact.

Comment A.13: Quote: “Subsequently, the IES “Lighting Handbook 10th Edition (2011) (the “NA” was dropped) was published, in a completely rewritten format, but it lacks all mention of lighting of

outdoor advertising. The recommendations of this publication were based on a report commissioned by the American Outdoor Advertisers Association. It has become something of a national model code for installation of billboards.”

We note that that, rather than using standards from the medical profession or from an agency such as the Environmental Protection Agency, Zeiger Engineers chose to use “recommendations” from the American Outdoor Advertisers Association. Mr. Zeiger further states that these recommendations are “something of a national model code for installation of billboards.” It is unacceptable for a supposedly unbiased engineering report to rely on the industry’s own recommendations for LED billboards which do not adequately address protection of human eyes, human psychological health, civil rights, and the special needs of people with disabilities. The Zeiger Engineers report is therefore heavily biased towards the industry.

Response A.13: The City of San José uses the same illumination criteria that was included in IES Lighting Handbook 10th Edition, and the Lighting Analysis Report referenced this source as a way of providing background information as to the source of the City’s criteria. Numerous cities have accepted and incorporated the criteria into their ordinances, and it has become the norm for evaluation of electronic signs. The comment does not provide substantial evidence that the project would result in a significant environmental impact.

Comment A.14: Quote: “Nighttime surface brightness of conventional billboards have been surveyed in studies conducted in Arizona (2009), New York (2008) and other cities. Those surveys provided results that show a luminance range from <100nits to <150nits.”

This is an important data point. Conventional billboards use spatially isotropic lamps to illuminate the billboard, with the result being a uniform luminance of 150 nits or less hitting the eye. The maximum comfort level for humans is around 300 nits of uniform luminance, with a maximum tolerance level of 50,000 nits. Therefore, a conventional billboard is not a significant health or safety hazard, just a visual blight.

Mr. Zeiger, however, then uses invalid calculations to mystically prove that the 9,000 nit spatially anisotropic, direct energy luminance from an LED billboard is safe. 9,000 nits far exceed human comfort level and is approaching the absolute maximum tolerance level of human beings. In addition, since the radiation from the LEDs is spatially anisotropic, this type of radiation has much more severe impacts on the human nervous system than spatially isotropic radiation. Therefore, 9,000 nits of LED radiation cause far more harm than 9,000 nits of radiation from an incandescent light source.

LED chip makers were already creating chips that emit more than 100,000,000 nits as of 2018, so while 9,000 nits may be the maximum for LED billboards today, it is likely that they will emit far more intense radiation in the near future. LED billboards pose an eye hazard and psychological health hazard due to the intense spatially anisotropic radiation.

Response A.14: Please refer to Response A.3 for a discussion of the 9,000 nits value and Response A.5 for a discussion of the comment letter’s claims regarding the effects of LED light on human health. The comment does not provide substantial evidence that the project would result in a significant environmental impact.

Comment A.15: Quote: “The value of <0.3 footcandle is relatively low but can be measured with a handheld photometer.”

This is a false statement as it would be applied to LED billboards. A handheld photometer is used to measure the illuminance from a spatially isotropic source. The software in the photometer is coded with the assumption that the light source emits radiation uniformly. For LED directed energy radiation, it makes no sense to attempt to measure the illuminance, because the radiation is focused and directed and non-uniform. The key measurement unit for an LED billboard is the luminance or radiance, which is the density of the radiation and is measured in a laboratory by the manufacturer. The key safety parameter is the intense 9,000 nits of spatially anisotropic radiation emitted by an LED billboard. The Zeiger Engineering report invalidly attempts to convert the 9,000-nit density measurement into a footcandle area measurement. This conversion would require knowing the luminance at every point in space, with a precision in the nanometer, picometer or femtometer range and then integrating across the area in question. The simple formulas used by Zeiger Engineers are not valid for spatially anisotropic radiation.

Response A.15: The industry standard is to use a light meter such as a handheld photometer with a standard diffusing receptor to approximate the 400 nanometers (nm) to 700 nm visual spectrum. This technique properly measures the illumination for LED signs. As discussed in Response A.1, classifying LED light emission from the proposed signs as spatial anisotropic radiation is incorrect. Please refer to Response A.3 for a discussion of the 9,000 nits value. Based on these facts, the comment does not provide substantial evidence that the project would result in a significant environmental impact.

Comment A.16: Quote: “The industry commonly uses approximately an 8 second duration time between static messages.”

Here again we see the deference to the industry, rather than to the medical research. The intense radiation and the messaging on the billboard are purposely designed to capture attention and make an impact on a person’s thoughts. An LED billboard violates the goals of the Vision Zero program by distracting drivers. Persons with autism can be highly focused and a person with even mild autism will be highly susceptible to this attention-grabbing effort. Thus, LED billboards also violate the Americans with Disabilities Act because they put persons with autism at high risk of injury or death. As noted in the Zeiger report, California does not have a safety standard for LED billboards, and thus the City of San Jose would be liable for any injuries caused by the LED radiation and the projected images.

Response A.16: Please refer to Response A.6. The Addendum concluded that the project’s impacts would be less than significant because the signs would comply with regulations established by both Caltrans and the City, such regulations that are intended to protect human health and safety. Note that while the comment asserts that “LED billboards also violate the ADA because they put persons with autism at high risk of injury or death,” no evidence is provided to support that conclusion for this specific project. Therefore, the City concludes that the comment does not provide

substantial evidence that the project would result in a significant impact with regard to drivers on U.S. 101.

Comment A.17: The Soft Lights Foundation manages two Facebook groups, Ban Blinding LEDs, and Soft Lights.

The requirement to join the Ban Blinding LEDs group is to answer the following question, “Which problem is worse, LED headlights or LED flashing lights on police cars?” A response we received on November 11, 2021, was “headlights & billboards are the worst.” While most responses are either LED headlights or LED flashing lights, it is not uncommon for respondents to share their hatred of LED billboards. As stated earlier in this rebuttal, the main beneficiary of the emission of this toxic LED radiation is Clear Channel and the public suffers the consequences of reduced safety, damage to health and degraded quality of life.

The fact that LEDs are unregulated and lack standards, cause sickness and eye damage, interfere with the human nervous system, are hazardous, and discriminate against people with light sensitivity disabilities will make San Jose and Clear Channel liable for the harm and discrimination they cause if LED billboards are installed.

Response A.17: Please refer to Responses A.5, A.6, and A.16. The comment does not provide substantial evidence that the project would result in a significant environmental impact.

November 11, 2021

To:

City Attorney
City of San Jose, California
cao.main@sanjoseca.gov

Re: Rebuttal to Zeiger Engineering Report on LED Billboards

Dear City of San Jose,

This letter is a rebuttal to the engineering report by Zeiger Engineers regarding the proposed LED billboards in San Jose. We assert that this engineering report is both heavily biased towards the LED billboard industry and seriously flawed technically, including the incorrect use of mathematics. Zeiger Engineers has conflated isotropic radiation from sources such as an incandescent lamp, and anisotropic radiation such as from LEDs, thus invalidating the entirety of the report.

Figure 1 is a photo taken by the Soft Lights Foundation on November 6th, 2021 in Yakima, Washington. As is obvious from the photo, the LED radiation is exceedingly intense and is endangering the eye safety, physical safety and mental safety of pedestrians, drivers of vehicles, and even pilots of aircraft.



Figure 1 – LED Billboard in Yakima, WA

Zeiger Engineers states that LED billboards emit an approximate maximum of 9,000 nits, but the report then uses invalid arguments and incorrect math to convince the reader that this 9,000 nit

spatially anisotropic radiation is somehow perfectly safe and compliant with safety standards. We rebut those arguments.

Figure 2 is a diagram showing the categorization of radiation. As we can see in the chart, candles, incandescent light bulbs, and High-Pressure Sodium lamps are all spatially isotropic radiation sources. LEDs, on the other hand, emit spatially anisotropic radiation.

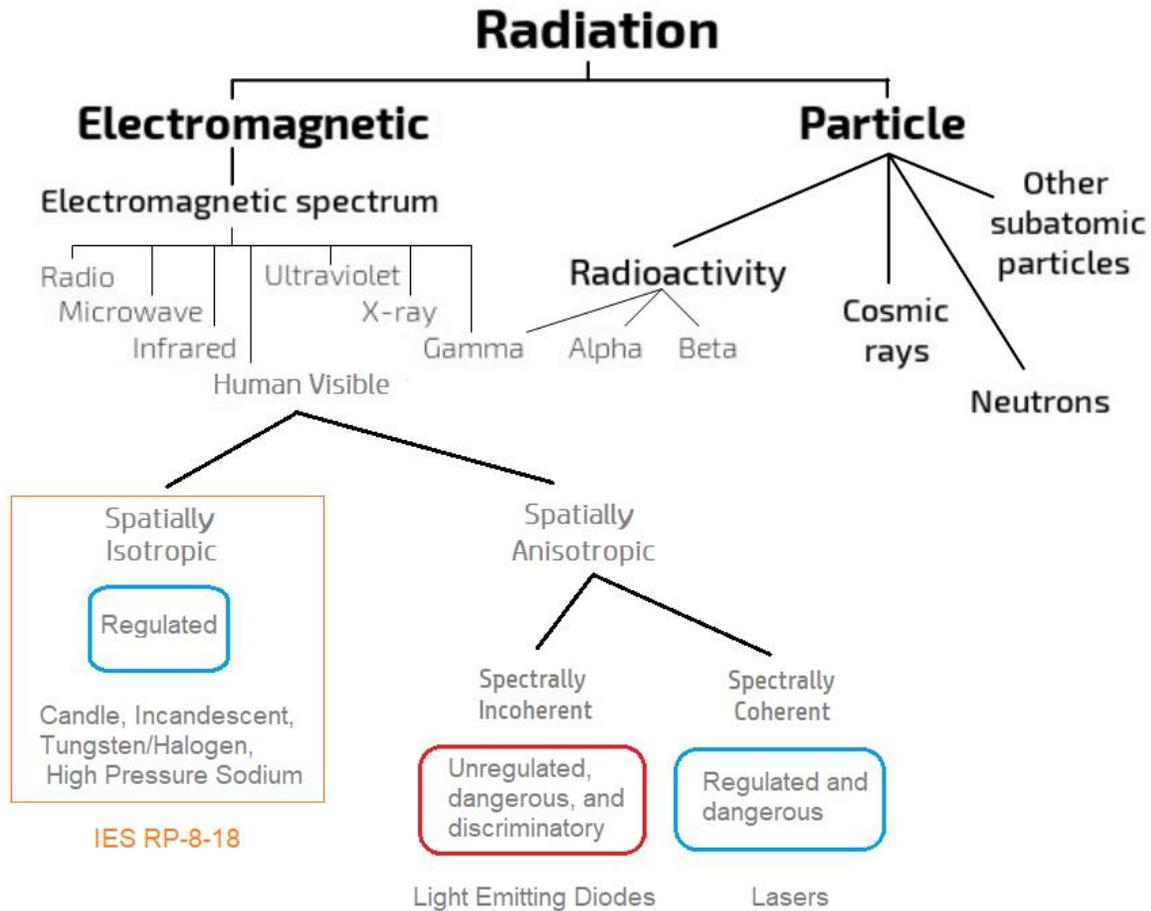


Figure 2 - Radiation Types

The Illuminating Engineering Society Recommended Practice for Design and Maintenance for Roadway Parking Facility Lighting (IES RP-8-18) is the de-facto standard for outdoor lighting for streets and parking lots. The references to “light” in IES RP-8-18 are for *spatially isotropic radiation in the visible portion of the electromagnetic spectrum*. The word “light” in IES RP-8-18 does not refer to microwaves, laser beams, or spatially anisotropic, spectrally incoherent radiation such as LEDs.

LEDs do not comply with existing standards, they emit dangerous radiation, discriminate against persons with light sensitivity disabilities and have unregulated spatial, temporal, and spectral characteristics. LED radiation has been shown to cause pain, sickness, eye damage, seizures, migraines, psychological trauma, vehicle accidents, loss of liberty, thoughts of suicide and likely loss of life.

To our knowledge, there are no ocular exposure standards for LEDs. In his 2009 presentation, Senior Engineer Michael Shulman of Underwriters Laboratories wrote, "Currently, neither the U.S. nor

Canada have mandatory standards or regulations for ocular exposure to LEDs emitting incoherent visible light."¹ In the research article, titled Light Emitting Diode Induced Retinal Damage² the authors state, "*Excessive LED light exposure presents a potential hazard to retinal function.*" In other research, those in Risk Group 3 (those with epilepsy, autism, migraines, photophobia, etc.) are often purposely ignored during the research, invalidating results that might have shown that LEDs are safe.

In the paragraphs below, we will address specific statements in the Zeiger Engineers report. The quotes are in the same order as they are written in the report.

Quote: "Project Design will also produce very little glare and potential for pilot distraction in the landing approach from the North (Runways 12L/12R) or South (Runways 30L/30R) due to the light control features on the billboards."

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Quote: "The billboards will control unwanted light (trespass or spill light) toward nearby airport operations, airport control tower, and Guadalupe River and riparian habitat."

All LED billboard radiation is unwanted. 93% of the public oppose being subjected to toxic LED radiation. The primary entity that desires the toxic radiation from LED billboards is Clear Channel in their pursuit of profits. As per the Zeiger report, significant engineering effort is being made to control the LED radiation so that is directed only into the eyes of drivers on the freeway, and not into the eyes of pilots or into the sky. The very idea of purposely directing harmful radiation into the eyes of the public is a clear violation of civil rights and leaves San Jose liable for all claims of eye damage, vehicle crashes, emotional trauma and civil rights violations.

Quote: "However, to operate at 100 percent white color, it would require turning off the ambient light sensor and disabling dimming control of the face as well. Normal advertising images are of course not "white", and the resulting "colored" brightness is greatly less than white as when the LEDs are operating much more efficiently."

We have seen many occurrences of LED billboards displaying 100 percent white. Frequently, this event occurs due to a technician error, setting the controller to display 100% white during routine maintenance. The results of operator error such as this are devastating, especially for a pilot attempting to land a plane with 300 passengers on board or drivers attempting to drive safely on a freeway. Figure 3 shows an LED billboard displaying the same 100% white that Zeiger Engineers contends will never happen.

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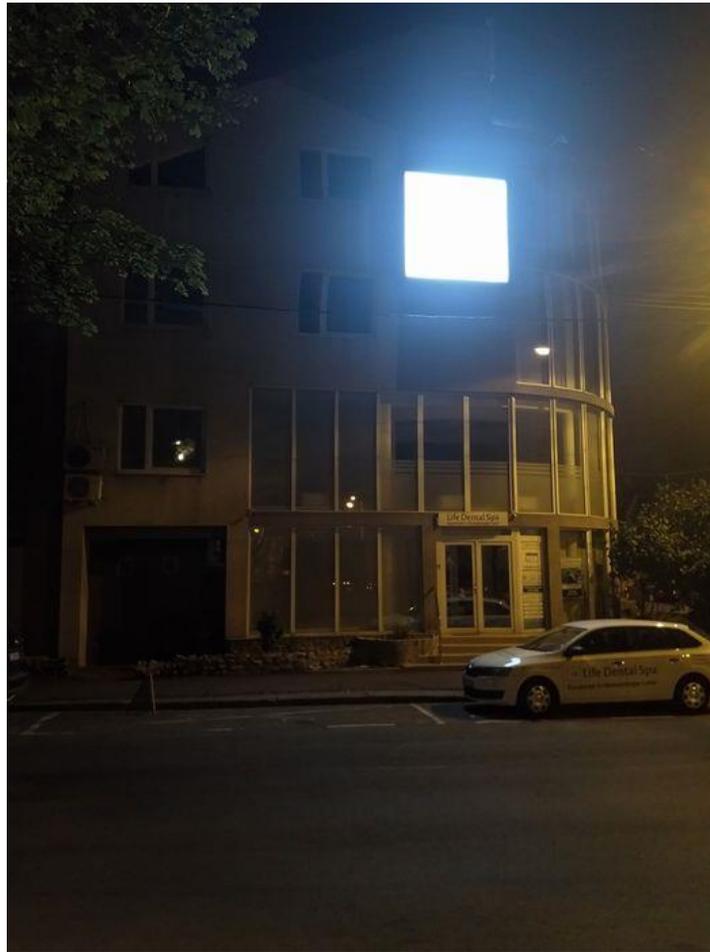


Figure 3 - LED Billboard Light

Quote: “Due to the upper shielding on the LED modules providing an 18 degree cutoff, planes within 1-mile of the billboards would need to be below 1,700 feet altitude to first observe the display, and at that distance the illumination would be less than 0.0012 footcandle (0.012 lux).”

The concept of “illumination” from an LED billboard is an inappropriate measurement unit when discussing eye safety and pilot vision. We note that the critical flaw in the Zeiger analysis is ignoring the luminance and radiance of the LED radiation from the billboard, which is unaffected by distance. In addition, the Zeiger report uses incorrect mathematical calculations, erroneously attempting to convert a density measurement into an area measurement.

“Luminance” is the density of the LED light. The full 9,000 nits of the LED billboard will be stabbing the pilot in the eye just as the pilot is attempting to land the plane. The Federal Aviation Administration currently regulates the radiance from LED lasers and thus it is a federal crime to shine a laser at an airplane. LED radiation is just as dangerous, and yet the FAA has no regulations for spatially isotropic, spectrally incoherent radiation. It is up to the City of San Jose to protect pilots from hazardous radiation from LEDs.

Figure 4 shows an LED billboard in front of a church. This photo was taken by one of our members, who provided a description of how this LED radiation affect her. *“Total freak out this morning. Beautiful morning so let my dog out the front yard for her morning constitution. When she went to the sidewalk and turned towards the church I followed only to be blasted full on and lost my sight, meaning My eyes got this over exposure in a flash. I got frantic went to my side yard only to be even more sensitive to the church’s LED lights I couldn’t see the ground or make much of anything. I know where my house is so I went back to get an umbrella to shield my eyes so I could find my dog. She is home and I am still sight fuzzy and mentally and emotionally drained.”*



Figure 4 - LED Billboard at Church

Quote: **“The above illuminations are much less than illumination of a full Moon, which typically provides only about 0.005 footcandle (0.05lux) –0.01 footcandle (0.1 lux) illumination.”**

A comparison of spatially anisotropic radiation from LEDs to spatially isotropic radiation from the sun and then reflected off the moon is inappropriate. LEDs are a directed energy source and do not provide uniform illuminance. There is no comparison between moonlight and light energy from LEDs, as they are different types of radiation.

Quote: **“The conclusion is that billboards will provide no more potential for pilot distraction as compared to other commonly found illumination sources, such as moon light, parking lot illumination, automobile headlights, freeway signage, building illumination, etc.”**

This is a false conclusion, as LED billboards are not “illumination sources.” LEDs emit highly directional, spatially anisotropic radiation that has been shown to cause eye damage, interference with

the human nervous system, and loss of awareness that endangers the lives of pilots, airline passengers, drivers, and the public.

Quote: “Subsequently, the IES “Lighting Handbook 10th Edition (2011) (the “NA” was dropped) was published, in a completely rewritten format, but it lacks all mention of lighting of outdoor advertising. The recommendations of this publication were based on a report commissioned by the American Outdoor Advertisers Association. It has become something of a national model code for installation of billboards.”

We note that that, rather than using standards from the medical profession or from an agency such as the Environmental Protection Agency, Zeiger Engineers chose to use “recommendations” from the American Outdoor Advertisers Association. Mr. Zeiger further states that these recommendations are “something of a national model code for installation of billboards.” It is unacceptable for a supposedly unbiased engineering report to rely on the industry’s own recommendations for LED billboards which do not adequately address protection of human eyes, human psychological health, civil rights, and the special needs of people with disabilities. The Zeiger Engineers report is therefore heavily biased towards the industry.

Quote: “Nighttime surface brightness of conventional billboards have been surveyed in studies conducted in Arizona (2009), New York (2008) and other cities. Those surveys provided results that show a luminance range from <100nits to <150nits.”

This is an important data point. Conventional billboards use spatially isotropic lamps to illuminate the billboard, with the result being a uniform luminance of 150 nits or less hitting the eye. The maximum comfort level for humans is around 300 nits of uniform luminance, with a maximum tolerance level of 50,000 nits. Therefore, a **conventional** billboard is not a significant health or safety hazard, just a visual blight.

Mr. Zeiger, however, then uses invalid calculations to mystically prove that the 9,000 nit spatially anisotropic, direct energy luminance from an LED billboard is safe. 9,000 nits far exceed human comfort level and is approaching the absolute maximum tolerance level of human beings. In addition, since the radiation from the LEDs is spatially anisotropic, this type of radiation has much more severe impacts on the human nervous system than spatially isotropic radiation. Therefore, 9,000 nits of LED radiation cause far more harm than 9,000 nits of radiation from an incandescent light source.

LED chip makers were already creating chips that emit more than 100,000,000 nits as of 2018, so while 9,000 nits may be the maximum for LED billboards today, it is likely that they will emit far more intense radiation in the near future. LED billboards pose an eye hazard and psychological health hazard due to the intense spatially anisotropic radiation.

Quote: “The value of <0.3 footcandle is relatively low but can be measured with a handheld photometer.”

This is a false statement as it would be applied to LED billboards. A handheld photometer is used to measure the illuminance from a spatially isotropic source. The software in the photometer is coded with the assumption that the light source emits radiation uniformly. For LED directed energy radiation, it makes no sense to attempt to measure the illuminance, because the radiation is focused and directed and non-uniform. The key measurement unit for an LED billboard is the luminance or

radiance, which is the density of the radiation and is measured in a laboratory by the manufacturer. The key safety parameter is the intense 9,000 nits of spatially anisotropic radiation emitted by an LED billboard. The Zeiger Engineering report invalidly attempts to convert the 9,000-nit density measurement into a footcandle area measurement. This conversion would require knowing the luminance at every point in space, with a precision in the nanometer, picometer or femtometer range and then integrating across the area in question. The simple formulas used by Zeiger Engineers are not valid for spatially anisotropic radiation.

Quote: “The industry commonly uses approximately an 8 second duration time between static messages.”

Here again we see the deference to the industry, rather than to the medical research. The intense radiation and the messaging on the billboard are purposely designed to capture attention and make an impact on a person’s thoughts. An LED billboard violates the goals of the Vision Zero program by distracting drivers. Persons with autism can be highly focused and a person with even mild autism will be highly susceptible to this attention-grabbing effort. Thus, LED billboards also violate the Americans with Disabilities Act because they put persons with autism at high risk of injury or death. As noted in the Zeiger report, California does not have a safety standard for LED billboards, and thus the City of San Jose would be liable for any injuries caused by the LED radiation and the projected images.

The Soft Lights Foundation manages two Facebook groups, Ban Blinding LEDs, and Soft Lights. The requirement to join the Ban Blinding LEDs group is to answer the following question, “Which problem is worse, LED headlights or LED flashing lights on police cars?” A response we received on November 11, 2021, was “headlights & billboards are the worst.” While most responses are either LED headlights or LED flashing lights, it is not uncommon for respondents to share their hatred of LED billboards. As stated earlier in this rebuttal, the main beneficiary of the emission of this toxic LED radiation is Clear Channel and the public suffers the consequences of reduced safety, damage to health and degraded quality of life.

The fact that LEDs are unregulated and lack standards, cause sickness and eye damage, interfere with the human nervous system, are hazardous, and discriminate against people with light sensitivity disabilities will make San Jose and Clear Channel liable for the harm and discrimination they cause if LED billboards are installed.

Sincerely,



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