10/28/22 Revised Narrative

PROJECT LIGHTING DESIGNER STATEMENT

in Response to

REVISED CONDITIONS for APPROVAL

West County Transportation

367 West Robles Ave. Santa Rosa, CA

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We have been asked to respond with comments and/or concerns regarding to the Sonoma County DRB's most recent Conditions for Approval for the new Exterior Lighting Systems planned for the new **WEST COUNTY TRANSPORTATION PARKING FACILITY** on West Robles Ave. in Santa Rosa, CA. The new Conditions that impact the Parking Lot Lighting Systems we have designed for the Facility are:

- Change the color temperature of the LEDs in all luminaires to **2700 deg**. (Kelvin), from the **3000 deg**. K currently specified.
- Reduce mounting heights of all pole-mounted Bus/Van Parking Lot luminaires from **30ft** & **35ft** to max. **16ft** high.
- Reduce mounting heights of all pole-mounted Staff Auto Parking Lot luminaires from **25ft** & **27.5** ft to max. **14ft** high.

GENERAL BACKGROUND on the DEVELOPMENT of the ORIGINAL PERMITTED LIGHTING SCHEME for this FACILITY

We understand that these new DRC Conditions have been adopted out of the natural concern that appropriate measures have been taken in the design of the exterior lighting systems for this new Facility, as necessary to limit as much as possible excessive light spill onto adjacent properties, and high levels of glare for nearby neighbors. Our firm was retained for this project partly because of our reputation – earned over the past 40 years - for consistently addressing these issues and concerns in our designs of lighting systems for scores of Facilities similar to this one.

In the earliest stages of Design for this new Facility, we evaluated a variety of combinations of lighting pole layouts and heights, luminaire intensities, distribution patterns, aiming orientations, and auxiliary shielding accessories designed to mitigate glare and spill light, settling on the selected conceptual approach integrated into our Permitted Design. In the later stages, we modelled each optional scheme using state of the art Lighting Design Software (A.G.I.) to evaluate projected results for each of the key criteria identified for the Project, including:

- Quantities of illumination at grade, at all of key areas - Pedestrian Walkways, Drive Aisles, Parking Zones, and challenging areas unique to Bus Parking, including the tall, narrow 'aisles' between parked Buses and Vans.

- Uniformity of illumination – the ratio of the highest to the lowest light levels, to ensure that the entire facility receives appropriate illumination, and not just 'pockets' - all in conformance with Industry Standards.
- Control of discomfort Glare directed to neighboring residences and limiting of Trespass or Spill light off-property.
- Project Energy Budget requirements and restrictions, in conformance with California Title 24 Energy Standards & Codes.
- Project Budget requirements and restrictions.

Our **ORIGINAL PERMITTED LIGHTING SCHEME** (as well as the Adjusted iteration we have just completed, which serves as the basis for each of the Exhibits attached to this Response*****) follows the recommendations of the Illuminating Engineering Society of North America (IESNA), State of California Codes and Ordinances, and the Standards of Care of our Peers in the Industry. When feasible, we have 'aimed' asymmetric distribution luminaires Southward, away from neighboring homes to the North and West of the Facility and equipped them with "Backside Shields" to block light that might otherwise be cast back, in the direction of neighboring properties as spill light, and creating the potential for glare for neighbors.

New Condition: CHANGE LED COLOR TEMPERATURE from 3000 DEG. TO 2700 degrees Kelvin

KIM LIGHTING, the manufacturer of the LED pole mounted cutoff luminaires specified for this Project, offers them with several LED Color Temperature Options, *including **2700 degrees K** (Kelvin)* (**3000 deg. K** LEDs are currently specified). Unfortunately, units ordered with this option produce 14% lower light output than the same units fitted with the (specified) 3000 deg. K. LEDs, while operating at the same power rating (14% less light output produced for the same amount of power consumed).

Given that the observable difference between **2700 deg. K** and **3000 deg. K** light sources is barely perceived by most observers, we strongly recommend against implementing this unnecessary change, and saddling this new Facility up-front with a **14%** penalty on the energy efficiency of the Lighting Installation that will affect ongoing operational costs for the life of the system.

We have been asked to offer our professional evaluation of possible impacts might be expected if the light poles are reduced in height as called for in the New Conditions of Approval. Following is a Summary of our Observations, Comments and Concerns:

New Condition: MAXIMUM 16ft HIGH POLES AT BUS/VAN PARKING LOT

The very high, but narrow spaces formed between the large buses and vans when they're parked side-by-side in high numbers, and the Drive Aisles provided to provide easy access to available parking spaces for Driving Staff, are especially difficult to light consistently well, and the only effective way to accomplish it efficiently is with luminaires mounted *sufficiently high overhead*, even at the 'single stack' Bus parking arrangement provided at this Facility. Our analysis indicates that there is no way to effectively and properly illuminate the wide, two-lane Drive Aisles provided at this Facility with

luminaires mounted on poles any lower than **27ft**, because the buses are so long that luminaires cannot effectively direct illumination down onto the drive aisle out past the rear ends of the buses and/or Vans, from mounting heights any lower, from the only pole location(s) where they can be protected from damage during parking maneuvers: *at the heads of the parked vehicles*. Placing the poles at any other locations would make both the poles – and Buses & Vans - vulnerable to physical damage during parking maneuvers. Therefore, the only effective way to illuminate the full width of the Drives Aisles is from luminaires mounted at a minimum height of **27ft** above grade, which is just high enough to provide the steep downward angle required.

The *ideal pole height* for this Bus/Van Parking Facility is in the range of between ***35ft** to **40ft** high,* because there is still a relatively small portion of the Drive Aisle not fully illuminated with mounting heights between **27ft** and **35ft**. In practical application, it isn't possible to providing 'Ideal Illumination coverage' that reaches every single corner in all areas of any Parking facility, because other important factors must be weighed against such coverage, including effective limiting of glare and trespass spill light, to benefit neighbors, ongoing operation and maintenance costs, and construction budget constraints, etc. Therefore, when designing our '**ORIGINAL PERMITTED LIGHTING SCHEME'** for this Bus/Van Lot, we settled on (shorter than ideal) **30ft** high poles for luminaires 'aimed' North or West (toward the Neighbors) and **35ft** high poles (with 'Backside Glare Shields') for those 'aimed' South (away from Neighbors), to provide adequate quantities of very high quality illumination that will minimize 'shadowing' from vehicles and trees, etc., throughout all areas of the planned new Parking Facility, and to mitigate as much as possible within the Project budget, generating excessive glare and casting spill light to neighboring properties. The attached Exhibits C-1 and R-1, which illustrate the results provided by our **'ORIGINAL PERMITTED LIGHTING SCHEME'**, clearly show that our efforts were successful by these measures: this design, with luminaires mounted at the original specified heights, provide exceptionally low levels of spill light off property, with very good levels of illumination provided throughout the New Parking Facility, including between parked vehicles and Drive Aisles, as well as at pedestrian walkways and Vehicle Entries.

However, attached Exhibits C-3 and R-3 clearly illustrate the opposite about the Scheme that has the very same luminaires mounted on poles as required by the new DRC Conditions, and are clearly too low. With this Scheme, appropriate light levels are achieved at the outer edges of the areas *directly beneath each pole*, and illumination levels between the poles falling to extremely low levels – all the way down to 0.00 in scores of locations between poles in the Bus and Van Parking areas, while levels that are much too-high levels - as high as 5fc - 6fc – are provided directly beneath every pole.

The computer-generated results clearly verify our professional view, which is: ***16ft high poles are entirely unsuitable for the lighting of this outdoor Bus/Van Parking Facility***. No amount of 'massaging' alternative pole layout options, combination of luminaire distribution features, quantities, outputs or aiming in a system consisting of poles limited in height to **16ft** can provide illumination at this Bus/Van Parking Facility that conforms with recognized Industry Standards, the recommendations of the I.E.S.N.A., or the design standards of this Office. As indicated above, luminaires must be mounted high enough to illuminate over and beyond the parked Buses and Vans, sufficient to cover enough of the full width of the drive aisles, to ensure the safety of Staff and Visitors who must walk to their destination

vehicles during hours of complete darkness. Luminaires limited in mounting height to only **16ft** are physically unable to accomplish this. We have determined with extensive computer modelling that the minimum required mounting height for luminaires that can supply illumination that meets these criteria is ***27***ft.

Contrast the unacceptable results provided by the DRC Stipulated Pole Height Scheme, with the performance provided by the "PROPOSED COMPROMISE SCHEME" (refer to the attached Exhibits C-2 and R-2 for the computer-generated IsoFootcandle / light level plot, and the corresponding Rendering of the lighting provided with this Scheme). Again, the lighting illustrated in these Exhibits are of the same Facility, with the same luminaire heads and pole placements as for the other two Schemes but utilizing our recommended "Minimum-required" pole heights: **27ft** poles at all Bus/Van Parking Lot luminaires, and **20ft** high poles at all Staff Parking Lot luminaires. The lowest light levels provided in the narrow spaces between parked Buses and Vans fall below 0.09fc or so, across only very small areas and at only a very few locations with this 'Compromise' Scheme, and the 'high' light levels (across relatively broad areas around the bases beneath the light poles) are neither too high, nor too low (in the range between 1.5fc to 2.1fc) – falling directly in the middle of the 'acceptable' range, even with the proposed compromise pole heights.

By every measure, the lighting provided by the **PROPOSED COMPROMISE SCHEME** nearly matches the performance provided by the **(Adjusted) ORIGINAL SCHEME** and is dramatically better than that provided by **DRC-STIPULATED SCHEME.**

Not unexpectedly, and as clearly illustrated in the attached Exhibits C-3 and R-3, the Computer Calculated IsoFootcandle Plot and corresponding Rendering for the "**DRC-STIPULATED/LOWER POLES SCHEME**", even with the same *layouts, quantities* and *locations* of luminaire *heads* as used in the **ORIGINAL PERMITTED (Adjusted) SCHEME***, when mounted on the *reduced height poles* stipulated by the DRC's new Conditions: **16ft** max. height at the BUS/VAN Lot, and **14ft** max. height at the STAFF Lot, the shorter poles have produce lighting results that are entirely unacceptable. The large vehicles literally cannot be 'overcome' by lighting emitted from luminaires mounted at such low heights. Only the *vehicle rooftops* and the *aisles directly below the luminaire poles* are well-lit (*TOO* 'well-lit', in fact) the remainder of the aisles, and the Drive Aisles themselves are shown in the calculations to receive far too *little* illumination.

For these reasons, our firm will not accept a commission to re-design this Project using poles less than **27ft** high at the Bus/Van Parking Lot.

New Condition: MAXIMUM 14ft HIGH POLES AT STAFF AUTO PARKING LOT

The Staff Auto Parking Lot, also modelled/calculated, and rendered in each of the (3) SCHEMES illustrated in the attached Exhibits, when illuminated with the 'Compromise' Scheme's **20ft** high Poles, is provided with still-excellent illumination - even though all (12) luminaires have been reduced in wattage and output ((6) in South row reduced from 140w to 65w, and (6) in North row reduced from 110w to 75w - offer the comparative benefits provided by the somewhat taller poles, that allow the lighting to effectively cover the entire lot – including between the cars, even with reduced-power luminaires

mounted on them, than can be produced with the 14ft high poles using the same number and locations of poles. With additional luminaire/pole assemblies more closely spaced, a lighting scheme for the Staff Parking Lot could be designed using the stipulated 14ft high poles at the Staff Parking Lot that meets all criteria, similar to that provided by both the ORIGINAL and COMPROMISE Schemes we have developed for this Lot, albeit at increased cost.

We do not find that the use of shorter poles in this application will provide any benefits to either the County, or nearby residential neighbors, such as reduced spill or trespass light, or glare mitigation.

We recommend keeping the same quantity of poles at the Staff Lot as is currently designed, but with the shorter, **20ft** high poles we call for in the "**PROPOSED COMPROMISE LIGHTING SCHEME**", in lieu of the currently specified **25ft** high poles.

*****In each of the attached Computer calc's & renderings, the following 'Adjustment' was made to the Luminaire/Pole Location Layout & Design (in response to the many large Oak trees now planned at the Bio Retention area): an entire row of the highest-output luminaire heads, that had been 'aimed' South in the "ORIGINAL" Design (the six - 170w luminaire heads on the Type **AC3** pole assemblies previously located along the South edge of the Bio Retention area in the Permitted Plans), was eliminated entirely, and the poles from that row – which also had (6) smaller/lower output heads ('aimed' North to the Staff Auto Lot, mounted down at **27.5ft** on the same poles), were shortened to **25ft** and relocated to the North edge of the Bio Retention area to light the Southern half of that Lot, in order to avoid having the numerous large Oak trees planned at the Bio Retention area from blocking most of the illumination from them required that we move the Staff Lot South row of luminaires North of all those trees) To mitigate against the potential for glare from these repositioned luminaires, we reduced their mounting height from 27.5ft to 25ft (which matches the other -North - row of Staff Lot poles), and reduced their wattage from 140w to 65w in the 'Adjusted' "**ORIGINAL PERMITTED LIGHTING SCHEME"** (we have attached computer generated Calculations and a Rendering for comparison with similar computer projections also provided, for the "**PROPOSED COMPROMISE**" AND "**DRC-STIPULATED/LOWERED POLES**" Lighting Schemes.