80 M STREET OFFICE LIGHTING TRESSPASS REPORT

To: Whom It May Concern

From: CM Kling + Associates, Inc

Date: 03 February, 2020

Re: Lighting trespass from office lighting north of 80 M Street, SE

To whom it may concern:

In response to questions raised regarding the amount of light trespass on surrounding buildings that may come from the upper level offices at 80 M Street, we have run photometric simulations and calculations to determine the extent of the expected trespass.

Our calculations were run on Lighting Analysts' AGI32 software. We used the following methodology:

The light trespass is measured on the south façade of the building located at 1025 First Street SE, Washington DC, with calculation points spaced 10'-0" apart. Exact building dimensions and materials were not available, so building height and reflectances were estimated based on photos of the existing structure (see Image 1 below). Scaled civil plans that included the building location could not be found, so setback of the building from 80 M Street was estimated at 90'-0" based on available maps and plans.

The structure for the building at 80 M Street was modeled from the latest architectural plans for the renovated building. Lower levels were modeled as blank walls with no lighting to allow our calculations to determine how much light will be coming from the new upper floors.

The latest architectural plans only indicate core-and-shell for the new levels. Schematic renderings were analyzed to estimate interior ceiling plan designs, and the beam structure sizes and reflectances were estimated based on these renderings (see Image 2 below). The curtain wall glazing was modeled based on the core-and-shell architectural plans, with an estimated 80% transmission rate.

The lighting fixture used for the calculations is a standard linear product often used in offices designed by CM Kling. The selected luminaire uses internal louvers to control glare. The fixtures were laid out and oriented in the space using best practices for office spaces, as recommended by the Illuminating Engineering Society (see Image 3 below). The light levels on desks in the offices are also derived from the Illuminating Engineering Society (see Calculation 1 below).

It is important to note that these calculations only take in to account the new construction on the upper levels of 80 M Street. The existing streetscape lighting, as well as exterior lighting on the surrounding buildings, was specifically excluded.

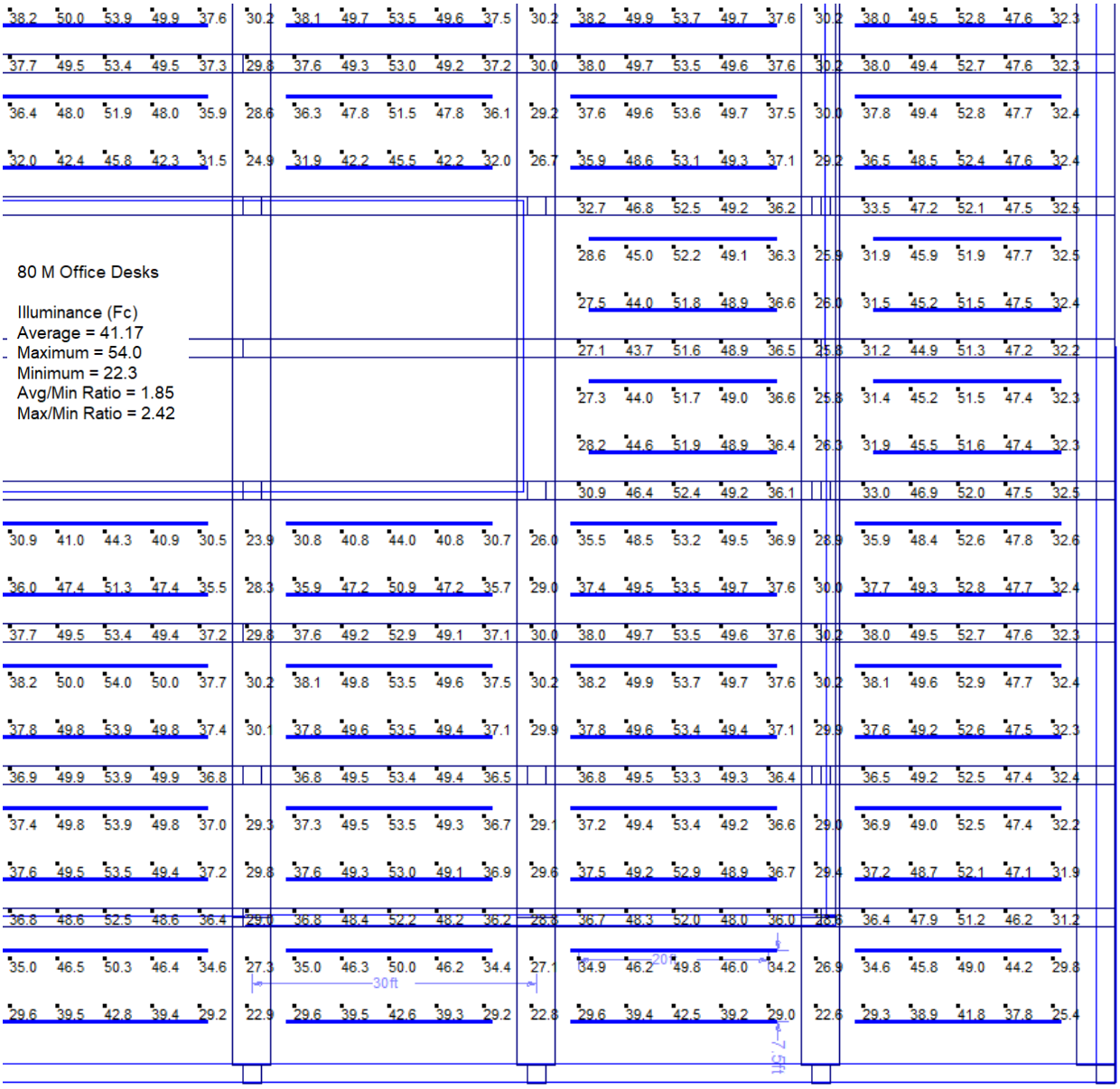
Our calculations found that across the entirety of the south façade of 1025 First Street, the new offices at 80 M Street will add an average of 0.18 footcandles. The brightest point on the façade that is being contributed from the offices is 0.5 footcandles (see Calculation 2 below). For reference, the National Optical Astronomy Observatory notes that 0.1 footcandles is equivalent to deep twilight (see Image 4 below, indicating common light levels from natural sources).

Note that the sequence of operations for office spaces will automatically dim or turn off lights in unused areas after normal operating hours. Only occupied spaces will remain illuminated, which will significantly reduce the light trespass.

This analysis of the proposed addition to 80 M Street SE concludes that the light emitted using a typical interior office layout will have minimal to no effect on the surrounding neighborhood. This study demonstrates an average impact of 0.18 foot-candles on the south façade of 1025 First Street SE, which is akin to amount of light experienced in deep twilight. The southeast corner of the façade of 1025 First Street SE receives slightly more light than the southwest corner because the south façade is longer than the north façade of 80 M Street SE. Typical office lighting will shine directly down on to work surfaces, with minimal light projection to the sides, resulting in a negligible amount of light above roughly the 80 foot elevation on the 1025 First St. SE façade. This analysis excluded all other ambient light in the immediate context to understand the lighting impacts of the proposed development on the neighboring property. The results of this analysis show the amount of light generated by the interior office layout is negligible when compared to the existing ambient light.

APPENDIX: Calculations and Images

Calculation 1: Interior lighting calculation points at Level 9, north east corner



Calculation 2: 1025 First Street SE south façade calculation points

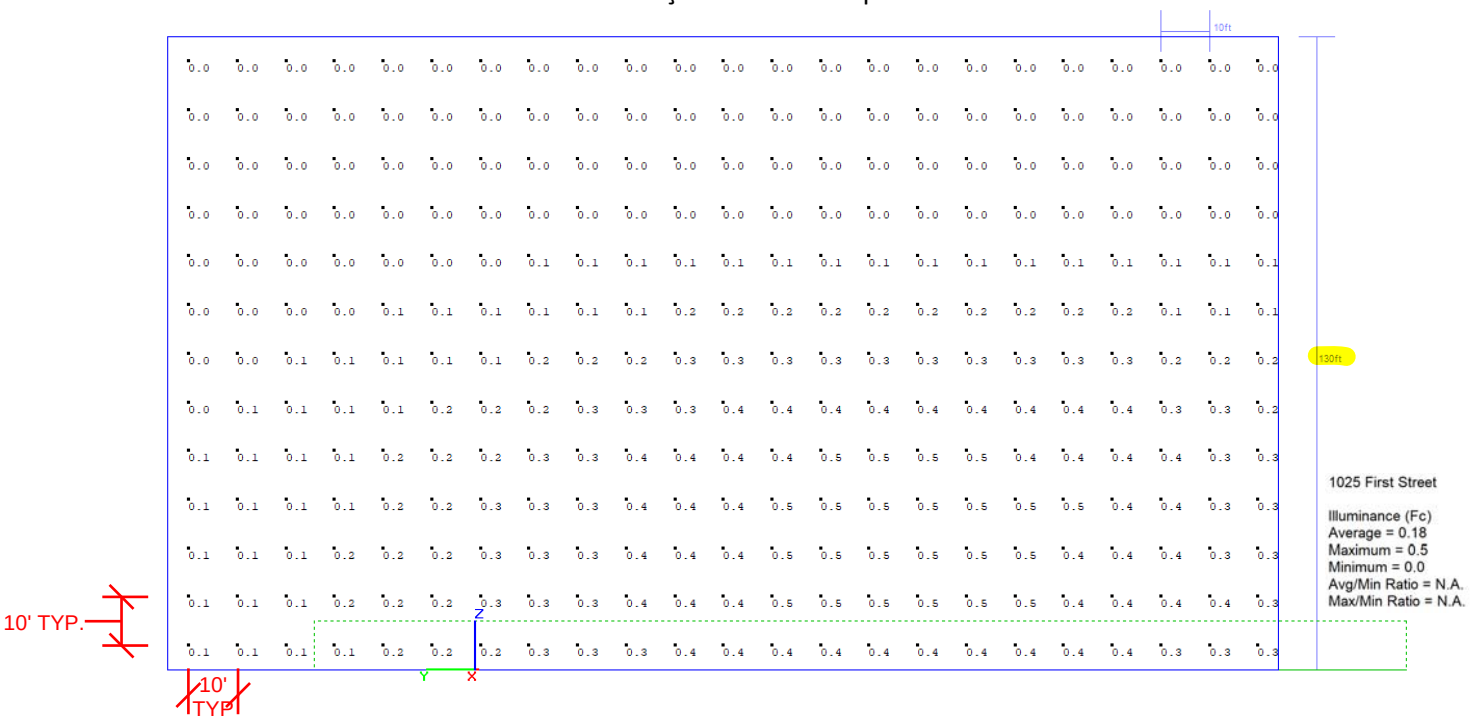


Image 1: Photo of 1025 First Street SE south façade

Image 2: Interior office rendering

Image 3: Light fixture layout in beam ceiling in AGI32

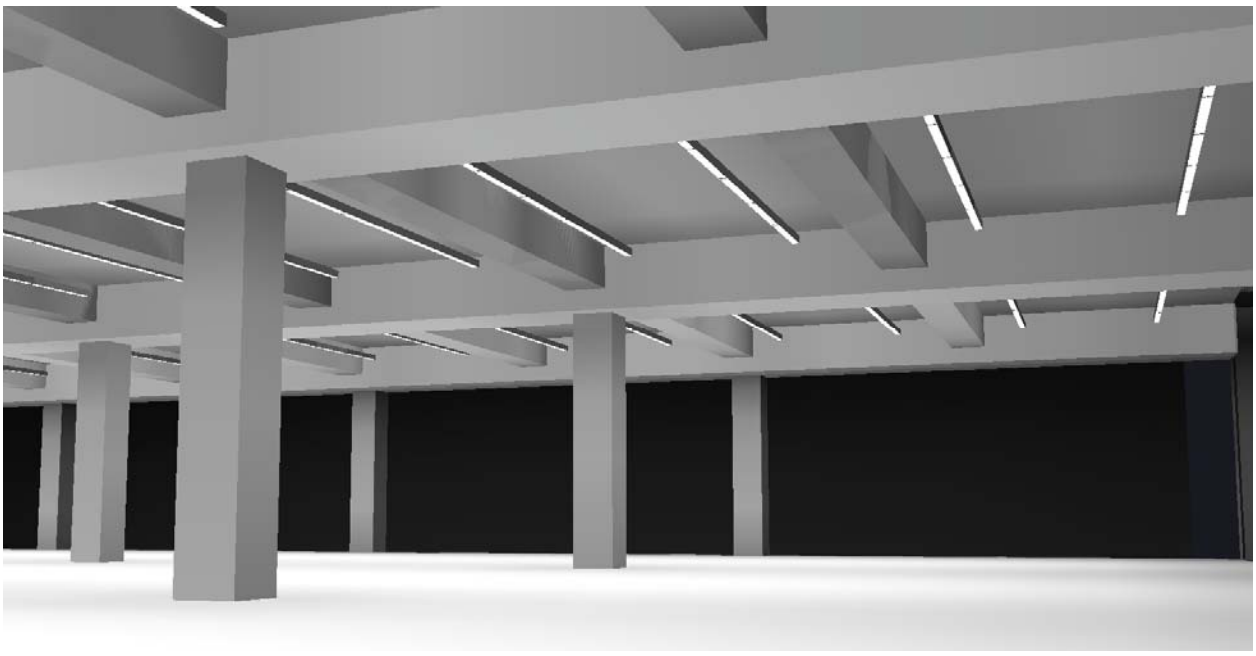


Image 4: Table from NOAO's Recommended Light Levels documentation

Common Light Levels Outdoors from Natural Sources

Common light levels outdoor at day and night can be found in the table below:

Condition	Illumination	
	(ftcd)	*(lux)*
Sunlight	10,000	107,527
Full Daylight	1,000	10,752
Overcast Day	100	1,075
Very Dark Day	10	107
Twilight	1	10.8
Deep Twilight	.1	1.08
Full Moon	.01	.108
Quarter Moon	.001	.0108
Starlight	.0001	.0011
Overcast Night	.00001	.0001

END OF REPORT